the OIL AND GAS JOURNAL

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"CHERT ISN'T A 'BOGEY MAN' ANY MORE!"

"A few years back, the mere mention of chert sent shivers down my spine. Of course that was before the development of the Hughes heavyweight drilling technique. When we hit chert nowadays we put on a Hughes W7 series rock bit with plenty of drill collar weight, cut the R.P.M. down and presto . . . we're churning through chert. It's another case of a Hughes 'Engineered Solution' for every drilling problem."

HUGHES TOOL COMPANY
HOUSTON, TEXAS
Standard of the Industry

PRICE 20 CENTS TABLE OF CONTENTS PAGE 25 DECEMBER 23, 1948

TO THE OILMEN OF TODAY AND TOMORROW

Merry Christmas!

The year's most glorious day---Christmas!---when business cares are put aside and youth takes over.

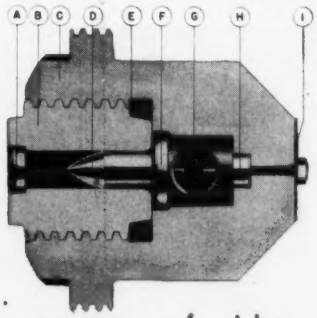
It is our most sincere wish that this Holiday Season be the merriest you have ever known...and that the New Year bring you greater success and full happiness.

THE CONTINENTAL SUPPLY COMPANY

Serving the Oil and Gas Industries

Since 1912

Penetration



Here are some of the reasons

(A) FLUID SEAL DISC. Seals interior of assembly from well fluids. Leaves no debris in well to foul testing tools, packers, etc., or to clog chokes.

(B) BARREL. Uniform precision of milled barrel and chamber threads permits interchangeability of barrels of varying calibres.

(C) CHAMBER. Constructed of very finest alloy steels to withstand internal pressures approaching 200,000 lbs. p. s. i.

(D) BULLET. A bullet for every perforating requirement. Spot weld to shear disc prevents movement in barrel and retains base of bullet in fixed relation to powder charge.

(E) THREAD SEAL. Pressure lip rubber seal prevents any possible fluid leakage through threads from reaching powder.

(F) SHEAR DISC. Confines powder gas pressure and directs full pressure directly to base of bullet.

(G) POWDER CARTRIDGE. Formed of fibre to contain accurate weights of the different powders available for different type jobs packed to proper densities.

(H) CONTACT PIN ASSEMBLY. Conveys direct current from wired gun port to filament. Washer and insulation eliminate loss of powder gas through back of chamber.

Balanced Design helps explain

LANE WELLS

TECHNICAL OILFIELD SERVICES

16 YEAR RECORD — 97% EFFICIENCY IN GUN PERFORATING

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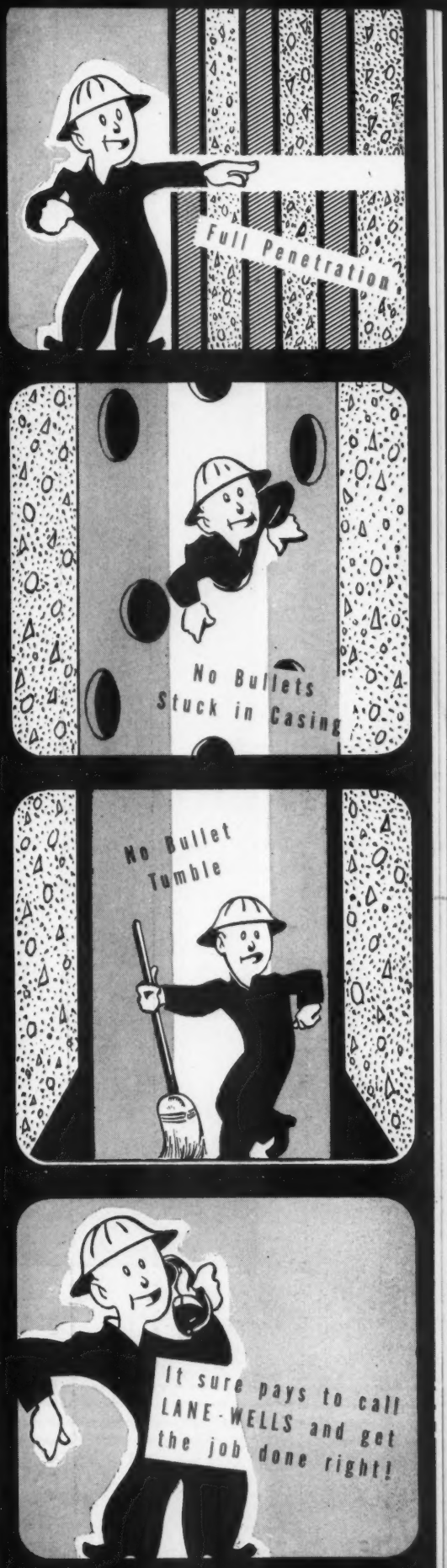

photo by Holland
Season's Greetings Wheatland Tube Company

Making the Most of Oil & Steel

Maximum recovery of marketable products with steel and construction costs held to a minimum form the constant pattern of our work. This earnest effort we apply with equal vigor to complete building projects and smaller remodeling jobs. Our Engineering & Construction Division may be reached over L. D. 307, Tulsa, Oklahoma. It is suggested you include us in your early planning so that our broad experience may be applied to the fullest.

Engineering and Construction Division

JONES & LAUGHLIN SUPPLY COMPANY

TULSA, OKLAHOMA

ONE major responsibility of this organization is to convert results of laboratory research and pilot plant operations into *profitable* refining facilities.

McKee's ability to discharge this responsibility is demonstrated by a long, world-wide record of sound, successful refinery engineering.

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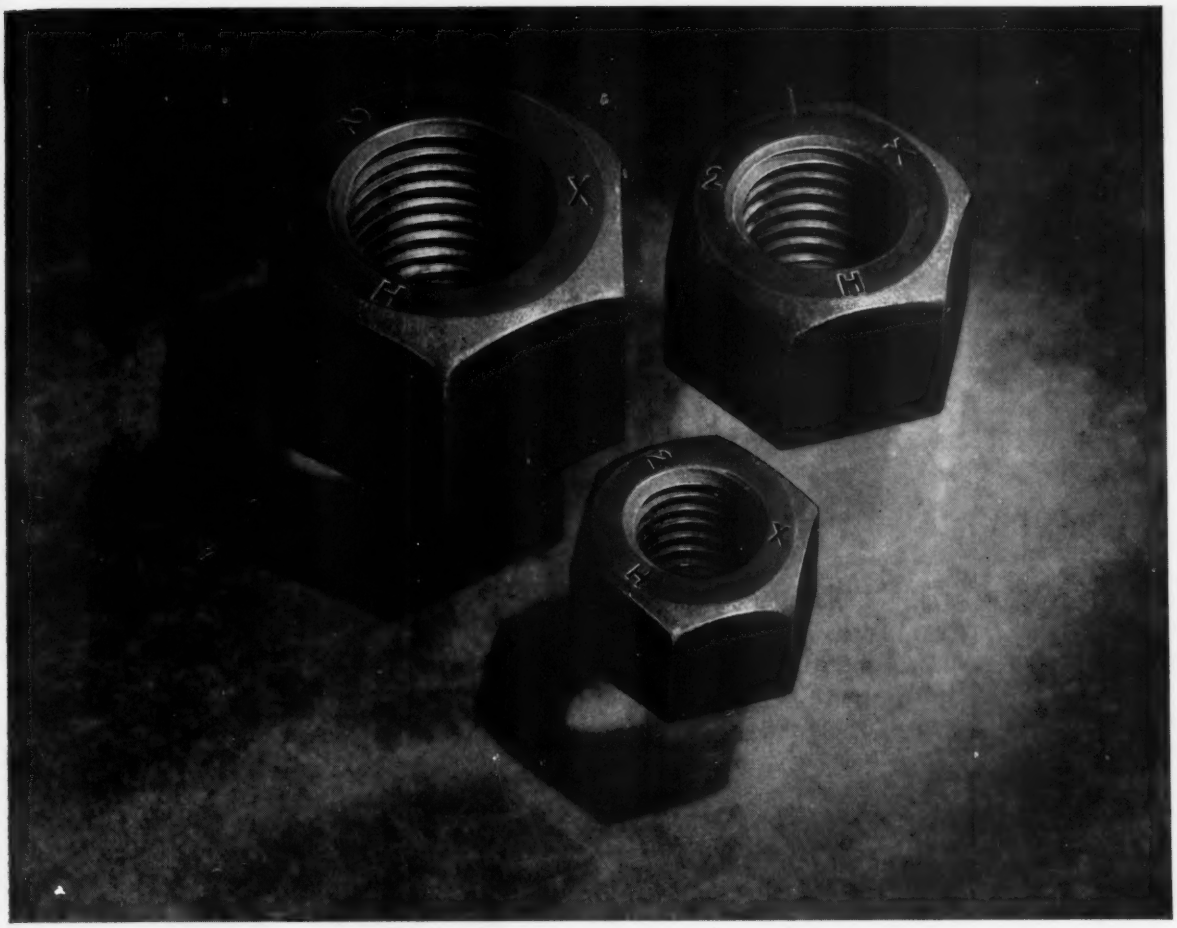
DESIGN, ENGINEERING AND CONSTRUCTION

FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

UNDIVIDED RESPONSIBILITY IN ONE ORGANIZATION



HOT-FORGED AND QUENCHED

...for extra strength

If you want a nut with extra strength—one that has what it takes for economical, month after month service in oil refineries, use the Bethlehem Quenched Nut.

There are two reasons why the Bethlehem Quenched Nut is ideal for refinery bolting: (1) hot-forging, and (2) quenching. This method of manufacture gives the properties needed for service at high temperatures and high pressures, and also arms the nut with sufficient tensile strength to break any stud or bolt on which it is used. Moreover, the nut has accurate, full-formed threads, and its oxidized sides are resistant to corrosion.

The Bethlehem Quenched Nut is furnished in bolt sizes from ⅜ in. to 3½ in., inclusive. It fully meets ASTM Specifications for a Grade 2H nut. Give it a work-out in a tough assignment.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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Bethlehem supplies every type of Fastening

BETHLEHEM STEEL

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Any V-BELT Changes Shape *when it Bends*

Prove this yourself!

That's Why the CONCAVE SIDE

(U. S. PATENT NO. 1813698)

Gives You 2 Big SAVINGS!

Bend *any* V-Belt and *f e e l* it change shape. The top, under tension, *narrows*. The body, under compression, *widens*. The sides of the belt bulge out.

Straight-Sided V-Belt

Straight-Sided V-Belt Bulges in Sheave-Groove.

The result, if the belt is built with *straight* sides, is a shape that does not fit the sheave groove — as shown in Figures 1 and 1-A, above.

Now, bend the V-Belt built with the precisely engineered Concave Side (U. S. Patent No. 1813698) — the Gates Vulco Rope.

Gates Vulco Rope With Concave Side.

No Side Bulge. Precise Fit in Sheave Groove.

You get the same shape change but *now* the new shape *exactly fits* the sheave groove as shown in Figures 2 and 2-A.

Results— (1) *Uniform* side-wall wear; *longer* life. (2) *Full* side-wall grip on the pulley; carries heavier loads and sudden load increases without slippage—a big increase in drive efficiency—saving belt wear a n d also saving power!

REG U. S. PAT. OFF.

The Mark of SPECIALIZED Research

The Concave Side is MORE IMPORTANT NOW Than Ever Before

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's side-walls.

Now that Gates *SPECIALIZED* Research has m a d e available to you SUPER Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side naturally delivers greater savings today than ever before.

4B12

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
"The World's Largest Makers of V-Belts"

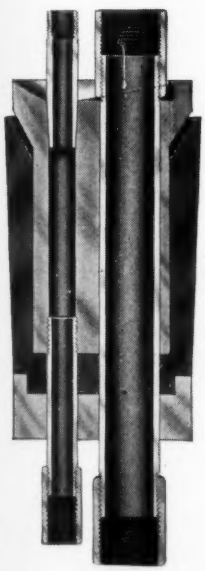
Well Control Keeps you out of the Red

★ Robinson Regular 3 in 1 Packer

Designed to set and pack in the open hole, the Robinson 3 in 1 Regular Packer assures outstanding results in repressuring oil sands, flowing oil wells, shutting in gas wells and acidizing lime wells. Its expanding cone makes it possible to pack oversized holes, or wells having irregular side walls. Steel rivets hold the step expanding cone in position during transit and while lowering into well.

★ Robinson Limit Plug

Constructed to accommodate large expansions with its cypress wood construction and its ample water courses, the Robinson Limit Plug was designed to withstand extremely high pressures. This now well-known product reflects the superiority of all Robinson products.



★ Robinson Rubber Cup Packer

The Robinson Rubber Cup Packer is but one of many Robinson "Specials". This efficient packer is economical and has been designed especially for packing off water in leaky casings. Field tested, it has been found to operate dependably and efficiently in casings from 500 to 2000 feet deep. To "Pack Away" those well-worries—turn to Robinson.

★ **Swaged Nipples**

★ **Bull Plugs**

★ **Casing Shoes**

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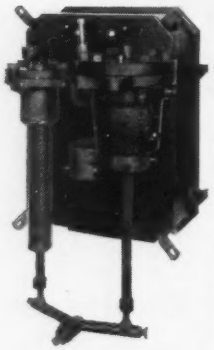
Factory: Coffeyville, Kansas

"FLOATING POWER"

in Taylor's new Mercury Manometer!



TAYLOR'S new "1500" Mercury Manometer is ready to step in wherever you need something *better* than present differential pressure measuring instruments. "Floating Power" is made possible by large float and long travel. This great power is transmitted by a precision-ground shaft and *Teflon bearings which "float" the power through to the pen. Other important features:

1. HIGH ACCURACY. *Inherent straight-line calibration* gives faithful accuracy at every point on the chart.

2. POSITIVE ACTUATION—High energy output. **(a)** *Big 3¼" float.* **(b)** *Long travel of float*—1". **(c)** *Simple lever system.* Stainless steel lever arm fastened to flat of pressure-tight bearing shaft with screw. **(d)** *Teflon in pressure-tight bearing surfaces* assures efficient use of power because: Teflon bearings, micro-finished shaft, silicone lubricant give unprecedented performance—leakless, and negligible friction under high working pressures. Union coupling on bearing housing prevents distortion of bearing and binding of shaft. **(e)** *Jewelled thrust bearing.*

3. DEPENDABLE PERFORMANCE. (a) *Submerged check valves.* Metal-to-metal seats; Positive shut-off in event of overrange. **(b)** *Unique damping valve* easily adjusted under full pressure without leakage. **(c)** *Ample capacity* in mercury chambers to accommodate effects of surges or pulsating flows. **(d)** *Teflon holds pressure,* yet allows shaft to rotate freely and assure long, dependable service.

4. GREAT ADAPTABILITY. (a) *Six interchangeable range tubes:* 10", 20", 50", 100", 200", and 400" of water. **(b)** *Tubes can be easily changed* in field without piping alterations. **(c)** *Both side and top* pressure connections. **(d)** *Two Manometers* can be mounted on back of single case for recording two Flows or for Ratio-Flow control.

5. EASE OF MAINTENANCE. (a) *Low pressure chamber* cover gives easy access to float and lever arm mechanisms during calibration. **(b)** *Entire pressure-tight bearing* easily and economically replaced.

The "1500" results from closely coordinated, highly specialized work by our Research, Engineering, and Development departments. Write for Bulletin 98182, or ask your Taylor Field Engineer. Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Teflon—synthetic plastic used in bearing surfaces—conforms to stainless steel shaft. Also minimizes friction. Because Teflon is inert to most industrial chemicals, bearing surfaces are generally unaffected by corrosion.

CROSS-SECTION REAR VIEW SHOWS FLOAT ASSEMBLY IN LOW PRESSURE CHAMBER, AND SUBMERGED NYLON CHECK VALVES.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

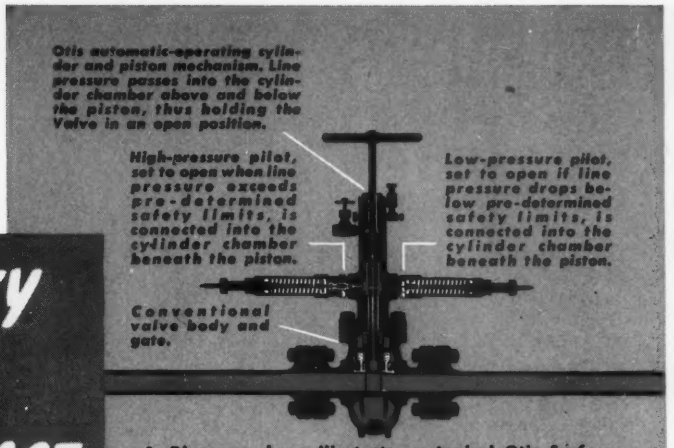
5 *

flow line SAFETY in a heavy-duty PACKAGE

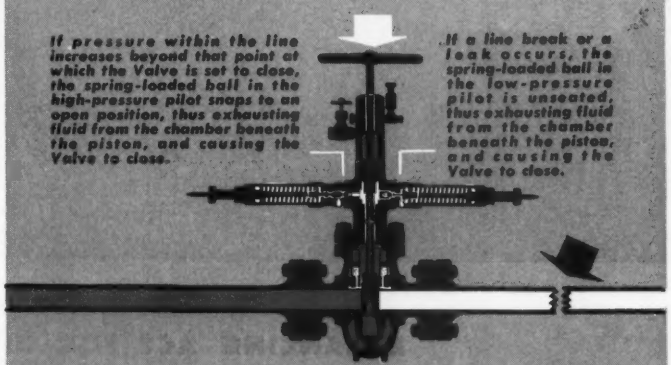
Otis Surface Safety Valves are full-opening pressure-operated gate valves which can be installed on single and two-zone well connections, flow lines, transmission lines, etc., to provide an automatic and positive shut-off when line pressure varies from predetermined high or low limits.

The Valves consist of an Otis Surface Safety Valve bonnet assembly (internal cylinder and piston arrangement) and either a high-pressure or low-pressure spring-loaded pilot valve, or both, combined with a conventional heavy-duty gate valve body and gate. The force which actuates the Valve may be supplied either by pressure from the line in which the Valve is installed, or by pressure from an outside source. The pilots are adjusted to open automatically when line pressure varies above or below an exact selected range. In either case, pilot action causes the piston to automatically drive the valve gate from a fully-opened position to positive shut-off — *the instant safety demands.* (For specific operating details, see diagrams on right.)

If your oil or gas lines are vulnerable to freeze-ups, breaks, leaks, or any other unpredictable condition which might cause pressure variations above or below safe limits, check with the Otis man nearest you. He is well-equipped with facts, figures, and case histories of numerous Otis Surface Safety Valve installations.


Otis automatic-operating cylinder and piston mechanism. Line pressure passes into the cylinder chamber above and below the piston, thus holding the Valve in an open position.
High-pressure pilot, set to open when line pressure exceeds pre-determined safety limits, is connected into the cylinder chamber beneath the piston.
Low-pressure pilot, set to open if line pressure drops below pre-determined safety limits, is connected into the cylinder chamber beneath the piston.
Conventional valve body and gate.

1. Diagram above illustrates a typical Otis Surface Safety Valve installation. The Valve is composed of a conventional valve body and gate; a bonnet and stem assembly incorporating the exclusive Otis cylinder-and-piston arrangement; and equipped with a high-pressure pilot (left) and a low-pressure pilot (right). These spring-loaded pilots are actuated, respectively, by an increase or decrease in pressure supplied by the line in which the Valve is installed. The complete Valve is self-contained and full-opening. (See Paragraph No. 2 below).


If pressure within the line increases beyond that point at which the Valve is set to close, the spring-loaded ball in the high-pressure pilot snaps to an open position, thus exhausting fluid from the chamber beneath the piston, and causing the Valve to close.
If a line break or a leak occurs, the spring-loaded ball in the low-pressure pilot is unseated, thus exhausting fluid from the chamber beneath the piston, and causing the Valve to close.

2. For example — presume that this Otis Surface Safety Valve is installed on the flow wing of a gas-distillate (corrosive) well which has a flowing pressure of 2100 p.s.i. The well, located in a river bed, is connected to a separator through approximately 200 yds. of exposed flow line, making the line vulnerable to flash floods and high water. The Otis Surface Safety Valve is operated by pressure from within the line. In case the line is broken and pressure drops below 1700 p.s.i. (that for which the low-pressure pilot is set) the low-pressure pilot is actuated, thus causing the gate valve to automatically close to a positive shut-off and remain closed until opened manually. Likewise, in the event the line is subjected to an increase in pressure above 2400 p.s.i., the high-pressure pilot is actuated and the Valve is instantly closed to prevent a line break.

PATENTS APPLIED FOR

***NO. 5** *in a series of high-pressure production problems and practices and the allied use of Otis Surface and Sub-Surface Controls and Services. Reprints of the series, suitable for filing, are available upon written request to Otis Pressure Control, Inc., Box 7206, Department B, Dallas, Texas.*

NEW LITERATURE AVAILABLE

"Otis Wire Line, Pressure Tubing, and Special Services" — a four-page illustrated folder describing the various Otis Wire Line and Pressure Tubing Services and special equipment. Write to address shown above.

PRESSURE CONTROL – OTIS – SERVICE – EQUIPMENT

OTIS PRESSURE CONTROL, INC.

SURFACE SAFETY VALVE

(T-22)

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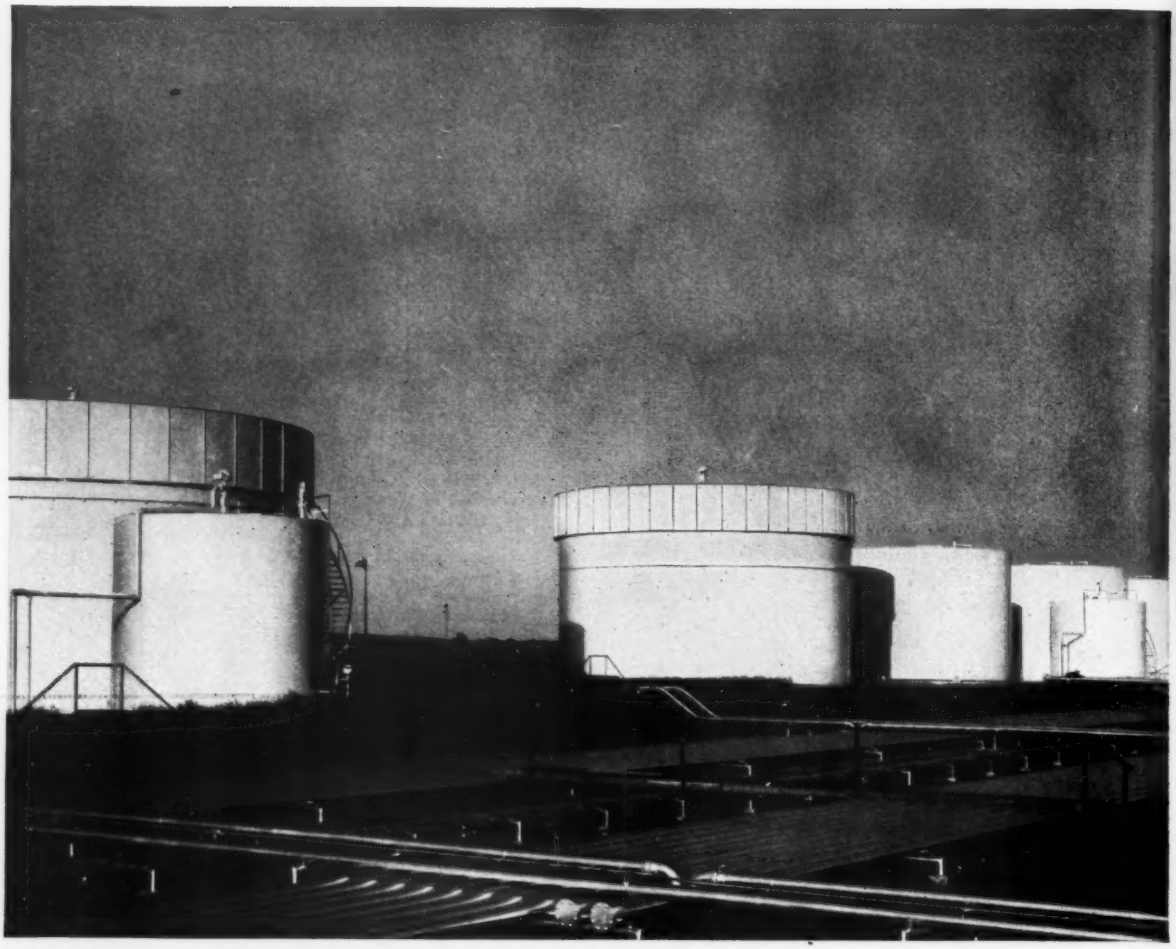

BALANCING ACT FOR HYDROCARBONS

When the volume pumped in exceeds the volume pumped out, there's danger of losing the most valuable part of your gasoline...the lighter fractions that mean superior performance in modern, high compression engines. The Expansion Roof Tank, either alone or manifolded to several cone roof tanks, acts as a balancing agent between the input and output rates and, in normal terminal operation, eliminates the possibility of filling losses.

This complete or near-complete elimination of filling losses is in addition to the absolute prevention of loss through standing or breathing. The Expansion Roof provides far more than the maximum volume required by vapor expansion due to temperature increases.

Available in a wide range of expansion capacities, the Expansion Roof is suited to most single or multiple tank storage facilities for production, refining, or marketing.

You'll find it profitable to investigate this balancing act for hydrocarbons when you plan increased storage equipment.

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GRAVER TANK & MFG. CO., INC.

East Chicago, Indiana

Graver offers a complete service to the petroleum industry including Expansion Roof Tanks, Floating Roof Tanks and pressure vessels. In addition, Graver is prepared to furnish specialized steel plate work such as fractionating columns and class one vessels as well as stainless and alloy fabrication; water conditioning equipment of all types; and through the Graver Construction Co., is prepared to handle all types of petroleum and chemical construction work.

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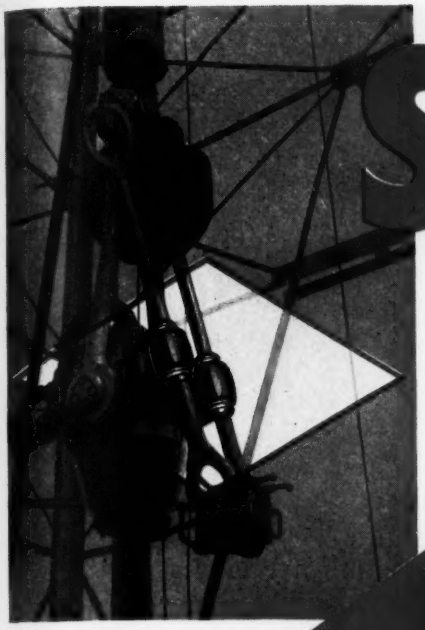

Save LINKS SWIVELS AND SWIVEL BAILS from wear

WITH THE NEW PATTERSON-BALLAGH Link Bumper

Here's an economical way to reduce wear on expensive equipment. Protect your links, swivel bail, and swivel from constant pounding with this new, low-priced LINK BUMPER. Made from tough wear-resistant rubber, this bumper holds the link away from both swivel bail and swivel to prevent wear at those two vulnerable points. Clamps may be loosened and bumper rotated to get double wear from each Link Bumper.

These Patterson-Ballagh Link Bumpers are easy to install. Each bumper is cut on one side as shown in the enlarged view. The bumper is quickly snapped over the link at swivel body height and made secure with clamps at each end. Streamlined shape with recessed clamp prevents catline and equipment from being fouled.

POPULAR SIZES AVAILABLE

Size Link	Dia. Link Shank	Overall Bumper Length	Bumper Dia.	Code Name
1¾"	2⅜"	12"	7⅜"	BAILEE
2¼"	2⅞"	11¾"	7⅜"	BAILOR
2¾"	3½"	11⅜"	7⅜"	BAILMENT

Link Bumpers more than pay for themselves by saving expensive equipment from needless wear. Ask your Patterson-Ballagh man about these new bumpers and then install a set on your links.

Specify

PATTERSON-BALLAGH

DIVISION OF BYRON JACKSON CO.

LINK BUMPERS

PATTERSON-BALLAGH · SEAL OF QUALITY · OIL FIELD SPECIALTIES

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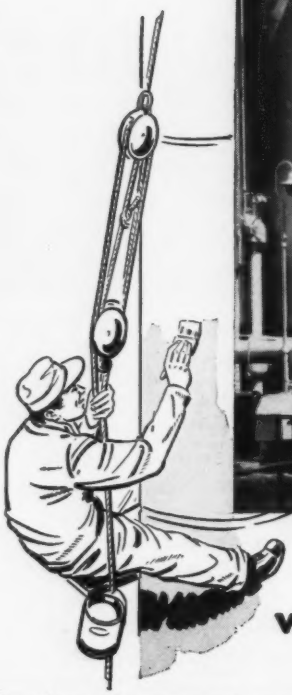
Acres of steel safely protected!



with DU PONT DULUX Metal Protective Paints

Rusting of exposed metal is an always-present maintenance headache for oil refiners. Structures and equipment require a *rugged* finish to protect the investment against this insidious disintegration. That's why so many maintenance men use DULUX for long-term protection.

These men make their selection on *facts*. They know the DULUX Metal Protective Painting System directly controls corrosion in two important ways. First, the resulting film is highly impermeable to moisture. Thus, an effective barrier is provided. Secondly, the DULUX Primers discourage rusting *chemically*. This two-way approach to the problem is their assurance of long-term protection.

Your selection of the quality paint . . . DULUX . . . is the best insurance you can buy. When you consider the large capital investment represented by your processing equipment . . . when you consider the extra dividends of the added life-span of the DULUX film, your cost-per-gallon is infinitesimal!

For technical advice on your maintenance painting problem, write to E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

DULUX
REG. U. S. PAT. OFF.
Metal Protective
PAINTS

May the happiness of Christmas,
Like the Music of a Song,
Make every day
A happy day
Through all the New Year Long!
Uncle Sandy
THE UNITED SUPPLY MAN

Courtesy
Service
Dependability

UNITED SUPPLY
AND *Manufacturing* COMPANY
TULSA, OKLAHOMA
Stores in Kansas, Oklahoma, Texas,
Louisiana, and New Mexico

No Rubbing! No Slamming!

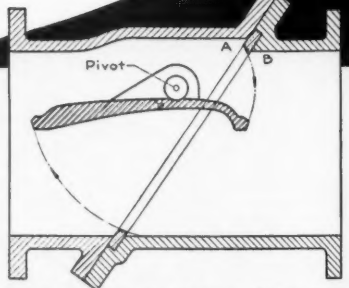
...just CUSHIONED CLOSING WHEN IT'S A CHAPMAN (TILTING DISK) CHECK VALVE

That's right! The balanced disc of a Chapman Tilting Disc Check Valve rides smoothly on the flow . . . lifts away easily when opening, closes quickly and quietly. There is no rubbing on the seat, no slamming . . . minimum wear on seats, hinge pins and bearings.

What's more, this design effects savings of from 65% to 80% in head losses over those experienced with conventional type check valves. And hammering and consequent strains on pipe lines are eliminated. Send today for your copy of the bulletin containing engineering data and reports of tests.

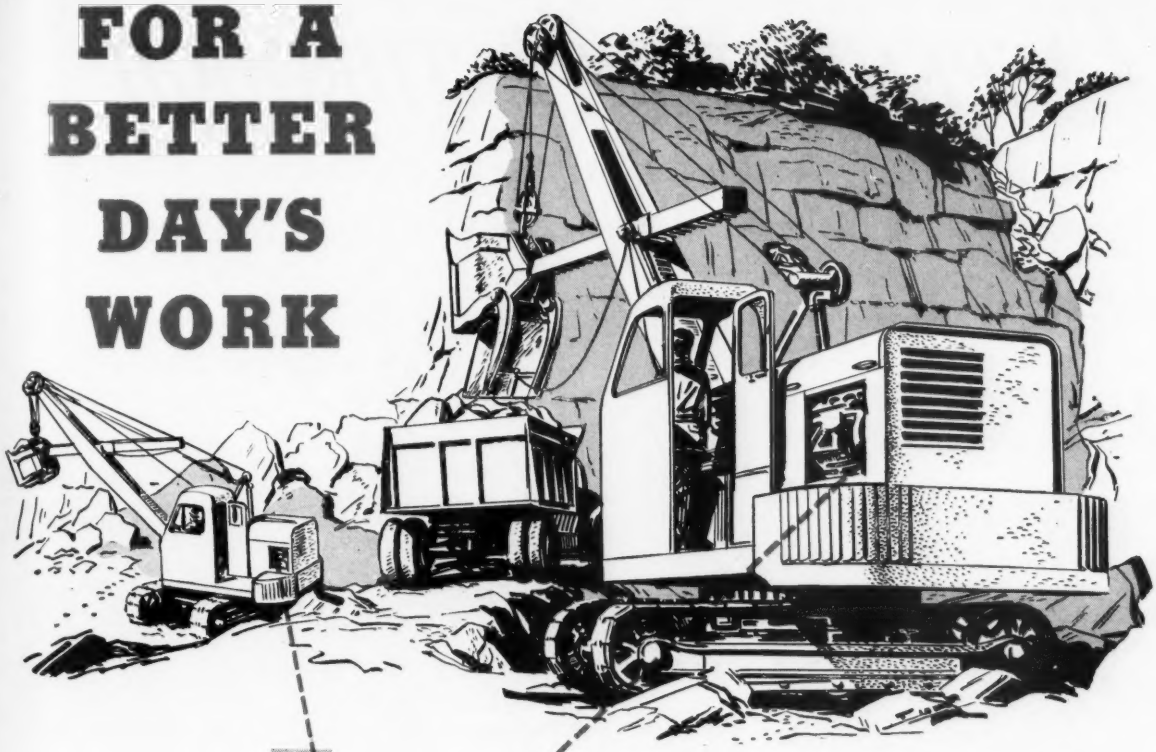
The Chapman Valve Mfg. Co.

INDIAN ORCHARD, MASSACHUSETTS

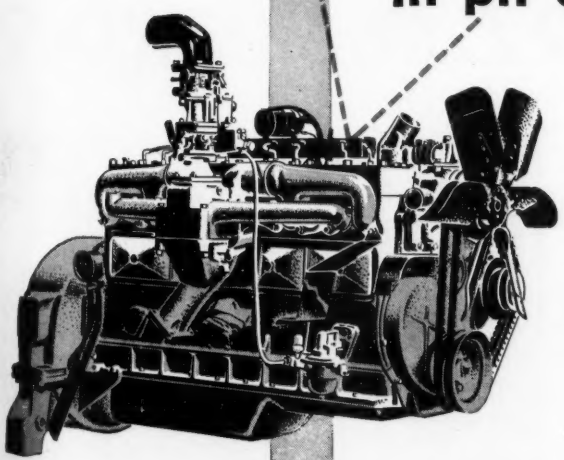


Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

FOR A BETTER DAY'S WORK



in pit and quarry operations



● **Where digging is tough and tricky . . . where steady, dependable power is the difference between profit and loss . . . you'll find Chrysler Industrial Engines and Power Units on the job! Chrysler Industrial Engines provide power *for a better day's work* on cranes, shovels, pumps, cableways, conveyors, drills, crushers and in other mining or quarrying equipment. For economical power that's tailored to *every* industrial application, see the Chrysler Industrial Engine dealer near you; for detailed data and specifications, write . . .**

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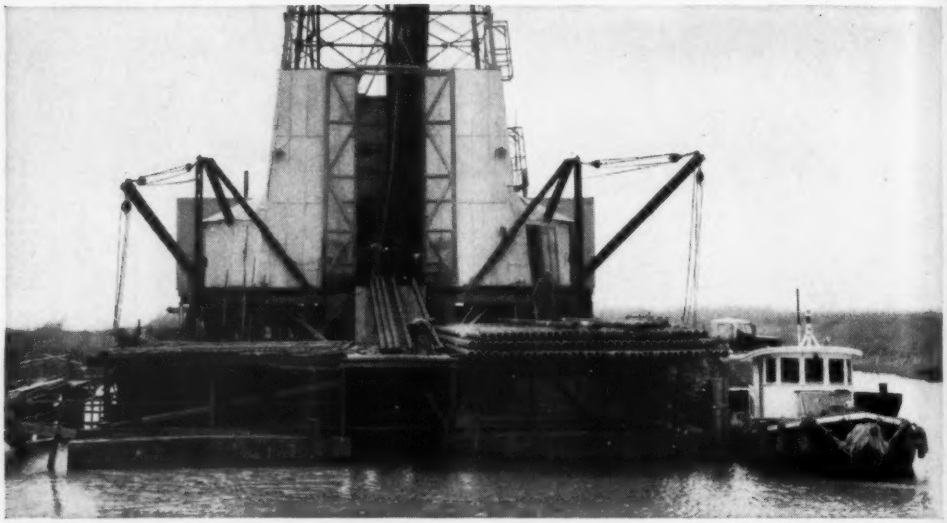
FACTORY-ENGINEERED AND TESTED PARTS WITH EXPERT MAINTENANCE WHEREVER YOU ARE

CHRYSLER

INDUSTRIAL ENGINES AND POWER UNITS

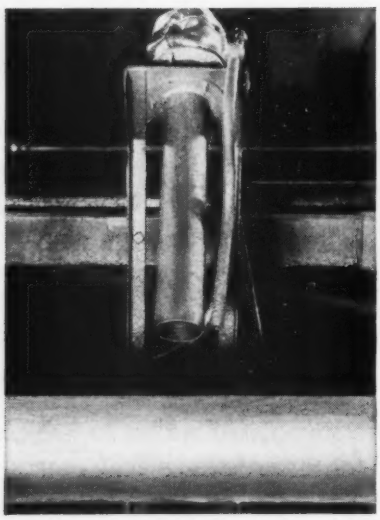
HORSEPOWER WITH A PEDIGREE

DEPENDABILITY THROUGH



IN A SOUTHERN FIELD: A 10,000-foot string of 7-inch S-80 and S-105 SMITHway Casing being run in the bayous of Louisiana.

RESEARCH AND ENGINEERING



IN THE A. O. SMITH PIPE MILL: This equipment is used for measuring and controlling Casing temperature for certain manufacturing processes.

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CORROSION PROTECTION

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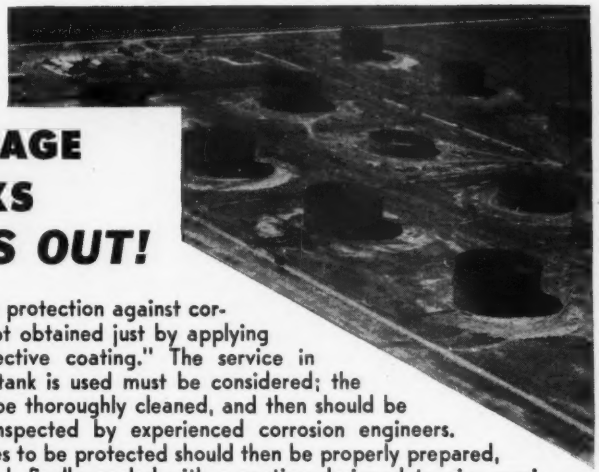

Adequate protection against corrosion is not obtained just by applying any "protective coating." The service in which the tank is used must be considered; the tank must be thoroughly cleaned, and then should be carefully inspected by experienced corrosion engineers. The surfaces to be protected should then be properly prepared, primed, and, finally, sealed with a coating designed to give maximum protection to each tank section from the particular type of corrosion encountered therein.

NATASCO assures maximum protection of equipment and investment because:

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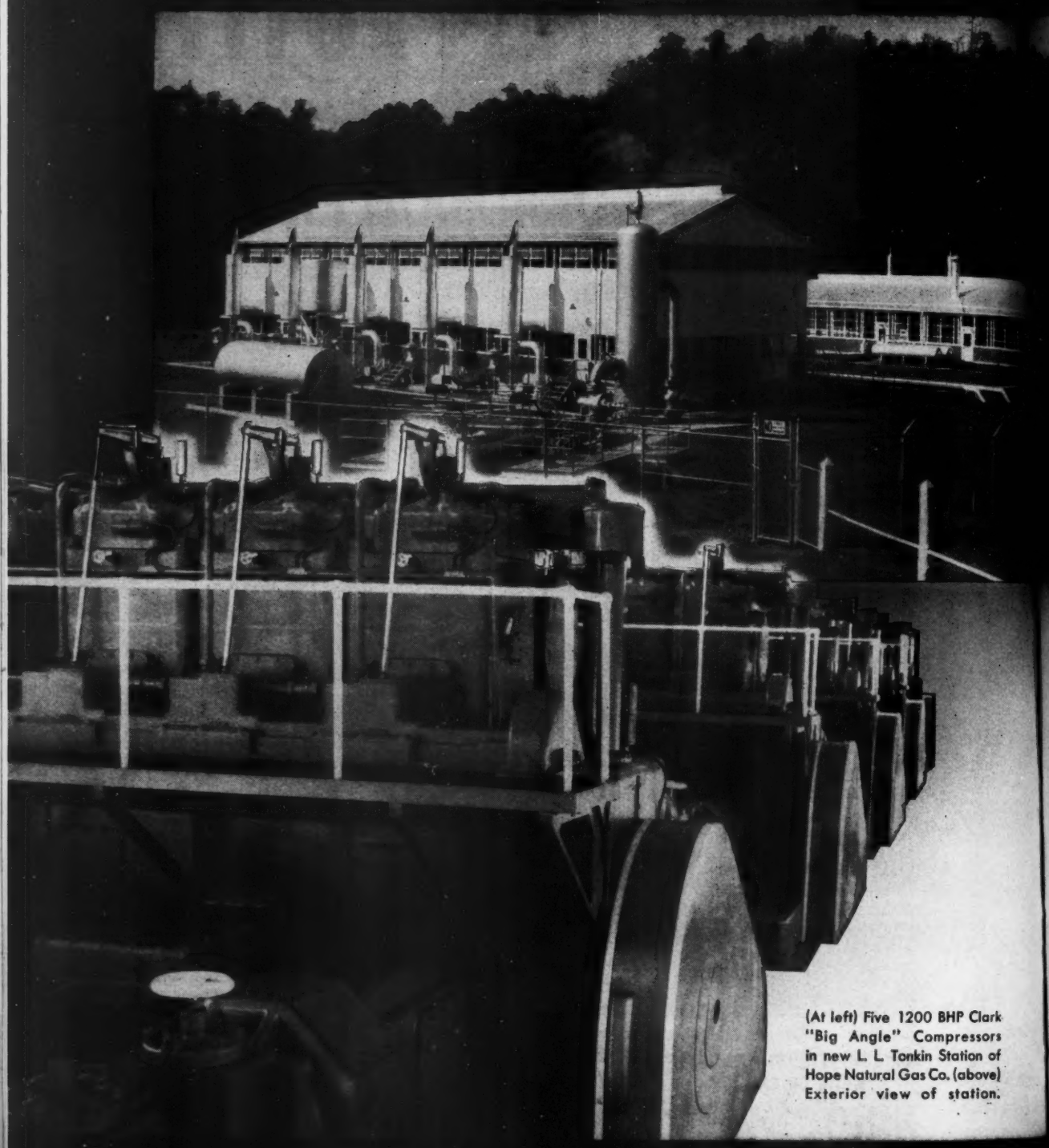

(At left) Five 1200 BHP Clark "Big Angle" Compressors in new L. L. Tonkin Station of Hope Natural Gas Co. (above) Exterior view of station.

It's
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tie
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CLARK

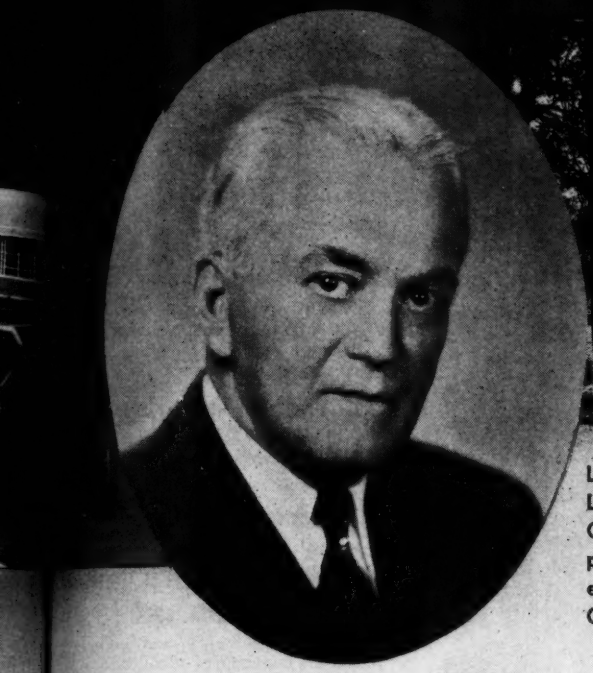
ONE OF THE DRESSER INDUSTRIES

"BIG ANGLES"

Wh
you

ES CLARK "BIG ANGLES"

IN NEW L. L. TONKIN STATION



L. L. TONKIN. Since his graduation from Cornell University in 1912, Loring L. Tonkin has worked continuously for the Hope Natural Gas Co., as meter engineer, construction foreman, division engineer, compressor station superintendent, assistant general superintendent, chief engineer, general manager and president. He is also a director of the Consolidated Natural Gas Co. and other associated companies.

It's not surprising that the working staff at "the best looking compressor station east of the Mississippi", chose to name the new station for their chief, Loring L. Tonkin, president of the Hope Natural Gas Company.

L. L. Tonkin Compressor Station is one of the most important links in the company's transmission facilities. Through this modern station in the West Virginia Hills, gas is moved to hundreds of thousands of users in Northern Ohio and Central New York.

Five 1200 BHP Clark "Big Angle" Compressors handle the gas, which is received at a pressure of 650 psi and discharged at 1100 psi.

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JOURNALLY Speaking

Pegasus' Pack

OUR unimaginative news editor said this picture is not news and is not of interest to the oil industry, but this department thinks it is both and also that it is very timely this Christmas week.

Only this toy collection lasts all the year around. These two young ladies, Doris Baker of Standard-Vacuum Oil Co., and Yolande Franz of Socony-Vacuum Oil Co., Inc., together with other members of the employes' organization known as the Pegasus Club, work several evenings each week maintaining a reservoir of toys for the kids in New York's Bellevue Hospital.

Santa's reindeer work one night a year but Socony-Vac's flying horse is on the job spreading cheer and good will all the year, and if that isn't news of interest to the oil industry we'll eat this picture.

Music Department

FOR some reason the oil industry has never been commemorated in song. It would seem odd that oil workers never evolved any ballads about their occupation as have cowboys, cotton pickers, sailors, and even the Volga boatmen, but if there ever was an oil song we never heard of it.

An attempt to correct this deficiency, however, was made a short while ago by Wheeler Milmore, publisher of upstate New York country weeklies and a member of the state legislature. While delving into New York's connection with the Interstate Oil Compact Commission he got so enthusiastic over the oil industry's essentiality that he burst into song, borrowing the tune from "On Wisconsin." Since Christmas is the season for singing, we pass it on:

Oil is very necessary,
Oil—Oil—Oil—Oil—Oil!
Wheels a-turning, fires a-burning,
More and more need Oil—Oil—Oil—Oil!
Give us credit, how we spread it,
Watch those diesels toil!
We now have found the world goes 'round
On Oil—Oil—Oil!

50th Christmas

THIS Christmas marks the fiftieth anniversary of petroleum refining in Texas, according to a clipping sent in by one of our readers.

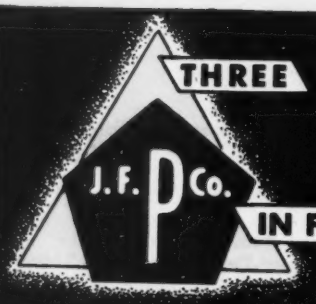
It was Christmas Day in 1898 that J. S. Cullinan, a young Pennsylvanian, lighted the first fires under the still of a refinery he had just completed at Corsicana. Oil had been discovered there 4 years earlier, but there was no commercial market until Cullinan set up business and offered to pay 50 cents per barrel for crude. That must have been a merry Christmas for all concerned.

Yule Chuckle

A
very
old wish
in the same
old words will
echo 'round the
world this week
in every language
so we thought that it
would be a good idea to
get away from the kind of
christmas tree used by the
oil industry the rest of the
year and use the more familiar
kind to wish all of our readers

MERRY CHRISTMAS
JOURNALLY SPEAKING

YOUR SYMBOL OF ASSURANCE



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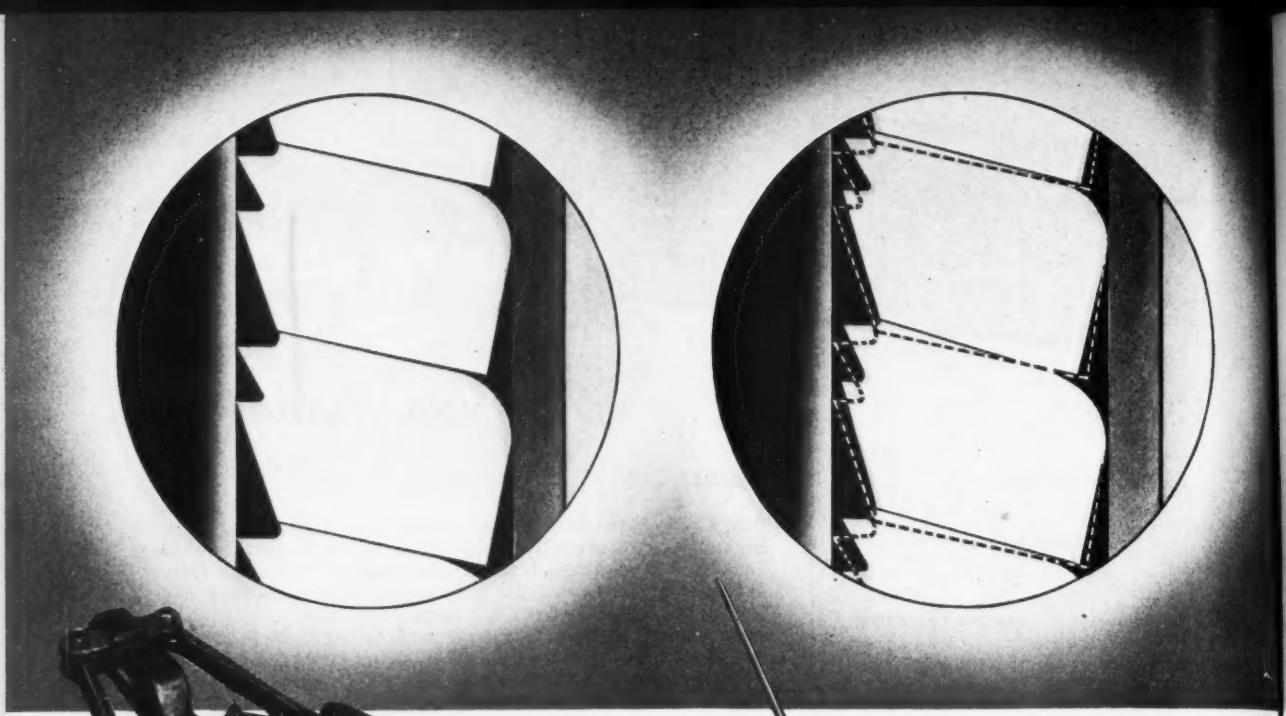

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THE OIL AND GAS JOURNAL

The Candle

CANDLES are burning throughout Christendom this week to mark the universal festival of joy and hope, just as they have burned for countless generations on the most solemn and the gayest occasions of man.

Since the dawn of history the candle has been more to man than mere illumination. Its soft, mellow light has always been regarded as a symbol of the things that make life worth while, a symbol of faith and worship, of peace and hope, of victory and joy.

Five thousand years before Christ the Chinese burned candles on ceremonial occasions. Long before the Christian era pagan peoples burned candles at the winter solstice to coax the sun back from the horizon and in thanks for its life-giving northward climb. In primitive cultures throughout the world the candle held a prominent place in religious ceremonies and secular celebrations.

Quite naturally and fittingly the candle has become a central part of the Christmas tradition.

It should be a source of some pride to the oil industry that candles are now made of petroleum wax, and that the industry, which has brought so much in material benefits, can contribute in this simple way to man's spiritual side by providing in quantity this symbol of the season, this reminder of the things that men live by.

As the candle burns this Christmas it needs to shine brighter than ever to bolster faith in the permanence of the beliefs and the institutions which it symbolizes. A way of life alien and intolerable to our Christian democracy threatens the world with an end to the burning of candles and to the things which candles mean to us.

As of old, let the candle give us faith in the soundness of our ideals, hope for their endurance, courage to fight for them.

Today is a critical period in the world's history, and in many places men are resigning hope, losing courage. We in this country know the rightness of the principles which have made America great. We know that in the dignity of man and the freedom of the individual lies the key to world peace and prosperity. But we are prone to despair.

The history of the candle can remind us that in times darker than these a well-kept faith and courage have triumphed over the forces of evil and aggression which seemed about to engulf the world. In such times the candle has helped inspire men to go out and fight for their ideals.

We need more fighting spirit today. We need to crusade to perpetuate our principles of government and of economics. In the Christmas candle, the petroleum candle if you please, may we find the inspiration to fight for the preservation of the way of life we know can bring peace on earth and good will among men.

Dual Crude Price System Ends as Phillips and Sinclair Cut Back

THE effort to raise the price of crude oil ended December 17 when Phillips Petroleum Co. reduced its price postings by 35 cents per barrel and returned to the prices it had been paying prior to September 28.

Within a few hours Sinclair Prairie Oil Co. and Sinclair Wyoming Oil Co. announced the same reduction, and by the end of the week similar action had been taken by the handful of smaller purchasers who had been meeting the prices of Phillips and Sinclair.

The reductions were effective for all grades of crude and in all fields where these companies purchased. Thus the oil industry has returned to the historic condition of a crude price uniform as among competing purchasers after an unprecedented period of a dual price system.

The Phillips company initiated its price-raising effort September 28 after a period of many months when the supply of crude being produced was barely able to meet demands but when it was evident that stocks of refined products were increasing rapidly, market weaknesses were beginning to appear for a few products, and there were signs that crude would soon be in ample supply.

Industry on Edge

For these reasons there was doubt from the first that other major companies would meet the increase. Except for half a dozen small purchasers, chiefly those buying in fields where Phillips was the major purchaser, no other company met the price until November 24 when the two Sinclair companies posted a 35-cent increase in all areas where they purchase.

During this period many companies lost substantial amounts of crude to Phillips and Sinclair and for several weeks the industry was on edge, watching to see if some other major company would be forced to raise its postings.

In announcing the price cutback, K. S. Adams, president of Phillips, blamed imports of crude and a combination of special curcumstances for "today's apparent supply-demand balance," and declared that failure to obtain an adequate price for crude will hamper the industry in developing additional reserves under current costs. He said:

"Phillips Petroleum Co. increased the price of crude oil because we are convinced higher prices are necessary to cover increased costs that are impeding the industry's efforts to fulfill its long-term obligations to its customers and the country. We respect the courage of that segment of the industry which not only believes as we do but met our advanced prices. However, failure of our principal competitors to advance their crude price postings has created a wide disparity between our crude costs and theirs, which situation obviously cannot continue indefinitely. It is with considerable regret that we are forced to reduce our crude-oil price postings to the levels paid by most purchasers.

Supply-Demand Balanced

"Only through an unusual combination of circumstances, all operating in the same direction, has today's apparent supply-demand balance been accomplished. Imports of oil have increased sharply and now are over one-half million barrels daily. At the same time, exports have decreased. During the recent shipping strikes on the East and West Coasts oil consumption was drastically reduced. A year relatively free from work stoppages in the coal industry provided an increase in supply of that fuel. Unseasonally warm weather throughout the principal heating-oil consuming areas held shipments far below normal. A supply-demand balance reached through such a combination of events is certainly no assurance of continued sufficiency of supply.

"Civilian and industrial demands for oil are increasing steadily and this trend will continue. In its defense program our country is spending billions of dollars yearly for land, sea, and air equipment of every sort. All depend on oil for their operation. In face of these growing demands, we have no place to turn for oil to replace any sources which might be cut off by an emergency, to say nothing of tremendous demands which would be imposed on this country by other nations affected by the same emergency.

"We no longer have a surplus productive capacity such as the 900,000 bbl. daily which was thrown into the breach during the past war to permit a drastic reduction in drilling. Even at the moment our own country's record crude production cannot supply our domestic requirements. If deprived of the more than one-half million barrels daily of imports, this country would immediately face an unprecedented oil shortage. A foreign oil supply thousands of miles away is a slender thread on which to hang our national security in these days of strained international affairs.

"Oil-industry earnings, expressed in presently inflated dollars, reached an all-time high in 1948. However, after paying a relatively small percentage as dividends, earnings retained were insufficient to carry the load of replacement and expansion imposed by rising demand. The cost of oil discovered today greatly exceeds the cost of currently produced oil which was acquired and developed when all costs were much lower.

"It is our conviction that the higher crude price we are now withdrawing is essential to cover the greatly increased costs. Without it the exploration and drilling program needed to meet future demand will not be forthcoming, thus making this country even more dependent on uncertain foreign sources of oil. Next year the industry's problem of providing funds for necessary expansion and replacement will be further complicated by higher costs and inadequate crude-oil prices."

W. L. Connelly, chairman of the boards of the two Sinclair companies, said:

"In view of the fact that the crude-price increase of 35 cents per barrel initiated by another purchaser on September 28 has been rescinded, Sinclair Prairie Oil Co. and Sinclair Wyoming Oil Co. are reducing their posted price for crude oil in all areas in which they purchase by the same amount.

"Further reason for the step now taken is that since the increase posted by Sinclair became effective the situation has greatly changed as indicated in a statement by the chairman of the Texas Railroad Commission that there is now 'a serious oversupply of crude oil and an increase of crude in storage of 233,932 bbl.' Although the fact remains that increased costs of production justify a higher price, it could not be maintained at this time because of the amount of crude now available."

District 5 Advisory Group Operations Suspended

WASHINGTON.—Operations of the District 5 regional advisory committee of the National Petroleum Council and its subcommittees were suspended last week by NPC Chairman Walter S. Hallanan, as a result of the return to normal of the West Coast oil situation.

The committee was called to action last fall, when the refinery strike threatened the oil supplies of California, Washington, Oregon and Nevada.

Hallanan's order was based on a report from the committee that available statistics "indicate supplies of petroleum products are sufficient to meet all normal requirements, including military and off-shore."

High Stocks Given as Reason for Sharp Cut in Texas Allowables

by Leigh S. McCaslin, Jr.

HOUSTON.—In cutting the state's January oil allowable by 250,985 bbl. daily—a cut of nearly 10 per cent—the Texas Railroad Commission cited increasing stocks of crude oil and crude products as the reason.

Effective January 1, the daily average allowable will drop from its present record level to 2,466,034 bbl. daily. This is 16,034 bbl. above the Bureau of Mines estimated market demand for Texas crude during January. It is expected that 246,000 bbl. of distillate and natural gasoline will be produced during the month. This would bring the state's total production of petroleum liquids to 2,712,034 bbl.

The cut for January was accomplished by ordering a 4-day shutdown in most Texas fields. Major exceptions were East Texas, Foster, and Panhandle. About 200 smaller fields were also exempt. East Texas is already on a 20-day producing month. Foster field was cut back 20 per cent, or 5,069 bbl., recently in an attempt to eliminate gas flaring. Panhandle field has been exempt from shutdown for many years. It produces only about four-fifths of its allowable. January will be the first month since September 1947 that the state as a whole has produced below legal maximum rates.

Allowables Listed by Districts

January allowables and the reduction from December 11 allowable figures are as follows:

District 1 (South Texas): 29,995, down 1,821.

District 2 (South Texas): 166,599, down 24,032.

District 3 (Gulf Coast): 472,653, down 59,466.

District 4 (Southwest Texas): 235,826, down 30,884.

District 5 (East Central Texas): 48,025, down 5,962.

District 6 (outside East Texas): 120,501, down 12,445.

District 6 (East Texas): 291,740, no change.

District 7-B (West Central Texas): 70,520, down 5,032.

District 7-C (West Texas): 50,027, down 5,743.

District 8 (West Texas): 702,276, down 91,706.

District 9 (North Texas): 167,280, down 13,746.

District 10 (Panhandle): 110,592, down 148.

As can be seen from the above, the largest cut was made in West Texas. Several operators in that area had stated before the commission that they no longer needed the crude which was being moved by rail in West Texas. Nelson Jones, attorney for Humble Oil & Refining Co., said its customer was no longer willing to pay 70 cents per barrel extra over the cost of oil moved by pipe line. He stated that Humble, the state's largest producer and purchaser, had a firm demand for all its crude except 26,284 bbl. a day from the Midland area which is being transported by rail. Stanolind Oil & Gas Co. also testified that it no longer needed the crude it moved by rail from the area.

Reduction Exceeds Request

In their nominations for the month, however, West Texas producers had asked for a drop of only 74,683 bbl. per day. The Railroad Commission allowable order reduced it 91,706 bbl.

In announcing the allowable slash, E. O. Thompson, commission chairman, said that the oil shortage had been "completely met" and said the cut was made because "the oil cannot be used." In substantiating his belief, Thompson said, "All oils have increased 88,000,000 bbl. in stocks above ground the past 12 months. There need be no fear anywhere of heating-oil shortage. Gasoline stands at over 9,000,000 bbl. in storage today, and by spring more than ample supplies will be available for any possible consumption in sight."

Will Odem, Austin engineer who is a member of the Interstate Oil Compact Commission's economics advisory committee, reported the beliefs of that group. The I.O.C.C. committee believes that the required supply during the first quarter of 1949 will be about 190,000 bbl. a day below current level. The committee assumed imports of approximately 545,000 bbl. daily—an increase of 45,000 bbl. over the current rate. Odem predicted that domestic producers face the prospect of losing markets to foreign oil as imports increase.

Comments upon the commission's action in cutting the allowable were quickly forthcoming from Texas oil men. Most seemed to believe that the commission was actuated by a desire to avoid a surplus. The opinion was expressed by a few, however, that the action might be in retaliation for the operators' fight to keep the commission from shutting in 41 oil fields for alleged gas waste. The operators have been successful, thus far, in preventing the state body from shutting in 15 fields on which shutdown orders were issued.

Another comment made on the action was this: Provided that there is going to be lessened demand for crude in January, why should Texas oil fields absorb the entire cut? Why not spread it around the country?

During the hearing on the allowable cut, it was brought out that 7,156 M.c.f. daily of gas is being flared in East Texas, one of the fields on which a "show cause" order has been issued. H. P. Nichols, Tyler, raised the point that the gas was being flared at the gasoline plants and not in the field by the producers. Chairman Thompson replied that the producers should ask plant operators why this flaring occurs, even though no gas is being flared by the wells of the field.

January nominations for gas production are up 541,851 M.c.f. from December to 7,986,342 M.c.f. daily.

Two other questions brought up at the meeting pertained to dual completions and a deviation rule for wells. The commission decided to set a separate hearing in January to hear testimony on dual completions. This question is the result of a dispute among operators in South Liberty field. Some are in favor of permitting dual completions and some are not.

As to a deviation rule, operators present generally agreed with a Humble proposal which would require permission from the commission before any well could be directionally drilled. The commission had asked, at previous hearings, for testimony on the subject. At present there is no statewide deviation rule. There are, however, field rules applying to deviation in several places.

Next statewide proration hearing of the commission was set for Austin on January 20.

Oil Line Export License Applications May Be Filed

WASHINGTON. — Applications for licenses to export oil line pipe during the first quarter of next year may be filed at any time this month and applications covering shipments during the second quarter may be filed any time after February 16, it was announced last week by the Office of International Trade.

Specific dates for the filing of applications for export of items on the positive list were set by the OIT in line with its intention to issue licenses against export quotas as soon as possible after applications are received.

Licenses may be issued in advance of the quarter for which the quota is specified, officials said, but ordinarily will not contain authorization to ship before the beginning of that quarter.

Shutdown Proceedings Now Involve One-Third of Texas' Oil Output

HOUSTON.—January 12 and January 25 are important dates on the calendars of Texas oil operators involved in the attempt of the Railroad Commission to shut down 41 oil fields representing one-third of the state's production.

On January 12, the state Supreme Court will hear the Heyser field case which has been appealed by the state following the granting of a permanent injunction to the oil operators. On January 25, operators in 26 fields will appear before the Railroad Commission to "show cause" why these fields should not be shut down.

Heyser field is one of 15 in which the state has issued shut-in orders. Temporary injunctions preventing the enforcement of the order have been obtained for all fields. A permanent injunction was granted by the courts for Heyser and Flour Bluff fields. The state is using Heyser as a test case before the Supreme Court in an attempt to lift the injunctions.

Show cause orders were the preliminary step taken as regards these first 15 fields brought under commission fire. If cause is not shown to the commission's satisfaction, shut-in orders are the next step. Hence, the 26 fields most recently to become involved are following this same procedure.

26 Fields Affected by Last Order

The 26 fields covered by the latest commission order produced 13,187,258 bbl. of oil in October or a daily average of 425,395 bbl. With the commission's order of this week slashing allowables, a 10 per cent reduction in this figure can be expected for January.

Fields affected and their October production in barrels are as follows:

District 1: Imogene, 13,504; Jourdanton, 45,272.

District 2: Lolita, 183,505; Porter, 9,437; Slick Wilcox, 141,806; Francitas, 31,251.

District 3: Amelia, 131,640; North Katy, 49,114; Oyster Bayou, 369,777; Red Fish Reef, 69,778; Thompson, 1,-137,306; Thompson North, 146,184; Thompson South, 193,314.

District 4: Conoco Driscoll, 101,525; Odom 66,827; Richard King, 88,873; Sun, 93,301; Sun North, 59,138.

District 6: Chapel Hill, 26,912; Navarro Crossing, 5,862; East Texas, 9,-397,993.

District 7: Todd Deep, 70,319; Todd Deed Crinoidal, 318,445.

District 8: Block 31 Devonian, 121,-482; Cowden South, 163,760; Fuhrman Mascho, 145,933.

In its order, the commission gave this resume of its fight to eliminate gas waste: "The Railroad Commission of Texas has for some years been working vigorously to prevent the wasteful flaring into the air of oil-well gas. In 1945, the commission caused an industrial survey to be made by leading engineers and executives of the Texas oil industry so that the industry would realize how much oil-well gas it was wasting by venting it into the air and burning it wastefully into the air.

"Then the commission called hearings in every part of Texas and by districts called upon the operators of the oil wells to promptly do something about this condition and divert this gas to some lawful purpose.

"In 1947, the commission called a show-cause hearing on the Seeligson field to show cause why the operators should not cease and desist from further wasting oil-well gas in that field. It went to court and the Texas Supreme Court decided that it was within the power and was the responsibility of the commission to cause such wasteful practice to be stopped wherever and whenever in a given field the quantity of gas great enough to make it economically feasible and reasonable to require the gas to be collected and utilized. Since then, the commission has been calling the roll of the oil fields to endeavor to prevent this waste of oil-well gas."

Commission Chairman E. O. Thompson announced last week that two letters have been received from oil operators commending the commission's stand. They were from George W. Dimock of Wichita Falls, president of the North Texas Oil and Gas Association, and D. Harold Byrd of Dallas, president of the Independent Petroleum Association of Texas.

In Dimock's letter he said, in part: "When a practice of waste of Texas' irreplaceable resources is deliberately continued, it certainly falls the duty of your body to bring whatever action is necessary to stop such practice.

"We know that as a commission you have always been reasonable in bringing such practice to the attention of the operators early enough to have the situation corrected, but apparently you were faced with no other course of action but to issue the orders you have and pursue their enforcement."

THE JOURNAL'S REPORT ON

INTERNATIONAL OIL

This year-end issue, an annual feature, to be published next week, presents a 70-page statistical picture of petroleum activities outside the United States, including reserves; production; transportation, both tanker and pipe line; supply and demand; exports of petroleum equipment; rotary-rig activity; and the Journal's surveys on international oil fields and refineries.

This report will show that rotary rigs, operating outside the United States, Canada, and Russian-dominated countries now total 499; that crude-oil production, exclusive of U. S. and U.S.S.R. areas, averaged 3.1 million barrels daily in 1948; that during 1949 world refining capacity will total nearly 10 million barrels daily, and that for 1948 and the future, petroleum and natural-gas pipe-line construction programs outside the United States adds up to 12,000 miles.

In addition, there will be two articles reporting on the technique of refining the crudes obtained from Saudi Arabian and South American fields.

Especially comprehensive is an article on the tanker-construction program. Figures are given on the present tanker inventory, and the size, speed, ownership, and age distribution of the world's fleet.

Another article explains how the European Recovery Program is the controlling factor in the United States foreign policy.

this week

CRUDE OIL—Effort to get general increase in price of crude fails as Phillips and Sinclair companies cut back to their old postings. . . . No other major purchaser had met the 35-cent increase they had maintained for several weeks. . . . Price again uniform as among buyers. . . . ¶Railroad Commission reduces Texas allowables by 10 per cent, citing oversupply in some areas. . . . ¶Independent producers express alarm at crude situation. . . . Blame excessive imports for apparent abundance. . . .

PRODUCTION—Texas commission preparing for legal battles to confirm its authority to close oil fields charged with wasting gas. . . . ¶Chairman-designate tells producers' association the commission needs power to prevent underground waste of oil by regulating production methods. . . . ¶Texas A.I.M.E. groups discuss improved production practices. . . .

ECONOMICS—Two major-company presidents tell congressional committee oil industry must have high earnings to finance expansion of facilities. . . . Say excess-profits tax would make it impossible to keep up with growth in demand. . . . ¶President of Phillips, in announcing crude-price cutback, predicts lack of adequate price will hamper search for new crude. . . . Blames imports and temporary conditions for current oversupply. . . . ¶Export quotas for petroleum products for first quarter of 1949 total the same as at present. . . .

TRENDS—For eighth consecutive week crude-oil production averages above 5,600,000 bbl. daily. . . . Week ended December 18 shows gain of 3,195 bbl. over previous week. . . . ¶For week ended December 11 stocks of four major products drop 712,000 bbl. . . . Marks first drop in total stocks this year. . . . Net drop in total stocks for 2-week period ended December 11 amounted to 280,000 bbl. compared to an increase of 5,753,000 bbl. for previous 2-week period. . . . Indication of leveling off in products stocks running about a month later than last year. . . . Distillate stocks show drop in each of past 2 weeks. . . . Residual stocks approach peak with an increase of only 214,000 bbl. recorded in past 2 weeks. . . . Running about 33,000,000 bbl. above last year's figure. . . . ¶Despite leveling off in stock levels products market continues generally "sluggish." . . . Lowering prices for some materials continue. . . .

INTERNATIONAL—Hungary rejects U. S. protest over seizure of American oil properties. . . . ¶Creole's pipe line from Maracaibo to Amuay Bay put in operation. . . . ¶Rehabilitated French refineries now producing more than before the war. . . . ¶Use of hydrogenation plants will give Bizonal Germany refining capacity equal to consumption. . . . ¶Bahrein Petroleum Co. maintains modern city for employes. . . .

NATURAL GAS—During 1948 gas industry served more customers than ever before, A.G.A. president reports. . . . Gas output, gas-utility revenues, and capital expenditures for expansion surpass all previous marks. . . . ¶Kansas Corporation Commission will intervene in attempt of FPC to block transfer of gas properties in Hugoton field. . . .

REFINING—New process for making synthetic acetylene gas from natural gas explained at A.C.S. meeting in Shreveport. . . . ¶Bureau of Mines official tells of reduction of cost in producing synthetic fuel from coal. . . .

PIPE LINES—Strip map is prepared for Imperial Pipe Line Co. over route for 450-mile Nisku, Alta.-Regina, Sask., crude-oil line. . . . ¶FPC authorizes Tennessee Gas additional facilities for specific purpose of transporting gas for Pittsburgh utility company. . . . ¶Chief engineer for Texas Eastern reports on circumstances of fire at company's station near Seymour, Ind. . . .

The effect of a motion-picture tour through the inside of a formation is given by this machine developed by Stanolind Oil & Gas Co. A diamond grinding wheel cuts off a thin layer of a core and the rock face is then photographed in color and the operation is repeated. When the film is shown the rock appears to melt away, permitting study of its composition

Excess-Profits Tax Will Prohibit Expansion, Holman, Dunlop Say

by Bertram F. Linz

WASHINGTON. — Spokesmen for the oil industry warned Congress last week imposition of an excess-profits tax at this time would directly prohibit further industrial expansion.

Two company officials, Eugene Holman, president of Standard Oil Co. (N.J.), and Robert G. Dunlop, president of Sun Oil Co., concurred with previous witnesses from other industries who had testified that even discussion of an excess-profits tax has had a deterrent effect upon industrialists who have major additions and expansions of plant facilities under consideration.

Testifying before the congressional joint economic committee, Holman explained that as a percentage of either total income or of investment, profits tend to be higher in the oil industry than in many other industries, but pointed out that this is a reflection of the nature of the business because of the necessity of continually seeking new sources of its raw material.

New Sources Require Capital

"In a dynamic industry such as oil, very large sums of new capital must be poured into the business regularly," Holman explained. "The situation is quite different from ore static businesses where, after the initial investment, operations can be kept going with relatively small amounts spent for replacement.

"In this country the demand for oil has risen more than 60 per cent since 1940, and it is still on the uptrend. In meeting people's demands for its products, the oil industry has measured up, particularly when one considers the magnitude of the problems it has faced in the postwar period. It is a highly competitive industry and, I believe, one of the most progressive and efficient. Its success in providing an abundance of petroleum products has been a vitally important factor in raising our standard of living."

In discussing industry profits, Holman told the committee, it must be borne in mind that the dollar today is worth only half of what it was in 1940; that since almost twice as much oil is being supplied consumers, the companies naturally have taken in more money; and since depreciation allowances are based on original cost, accounting profit does not now give a measure of the funds available for increased capacity and for dividends as it did before the war.

Jersey Standard's net income has risen substantially in the postwar years, he said, but every dollar of profit over and above conservative dividends to stockholders has gone into new equipment and facilities, yet, "taking the 3 postwar years together, our cash earnings will have failed to meet our cash requirements by a total of $158,000,000."

Bringing the profit figures down to consumer levels, Holman said the 1940 profit was 1⅓ cents per gallon, while this year it will be approximately 1⅝ cents, but in terms of what the company can buy with that money, the amount per gallon this year is only about 0.8 cent in 1940 dollars.

Holman explained that oil companies need large financial resources because, first, the business is one of continuous expansion; second, an oil field may take months or years to develop even after oil is discovered; and, third, obsolescene is high, especially in refining, because of rapid technological progress.

"We must be assured, therefore," he said, "that funds will be promptly available to finance new developments as they become possible and necessary. Many of the ventures which an oil-producing company must take are speculative and are not suited to borrowing. As for raising equity capital, there have been many times in the past 20 years when it would have been extremely difficult, if not impossible, to obtain such finacing at reasonable rates.

Available Capital Desirable

"We prefer, wherever possible, to finance new ventures without recourse to the capital market. We believe that the policy of retaining substantial proportions of earnings in the business, in order to assure prompt availability of capital when needed, benefits the consuming public and the stockholders."

Holman told the committee his company resisted price increases "by not attempting to outbid other buyers and by publicly expressing our opinions on the undesirability of crude-price rises," but found that refusal to pay going market prices resulted in losing crude supplies in amounts which jeopardized its ability to meet customers' needs and was forced to pay more for crude on two occasions in the past 18 months.

"This experience demonstrates how crude-oil price is determined by supply and demand through the action of a large number of suppliers and purchasers in the market place," he said. "Some may lead, some may lag. But in the final analysis, all must adopt substantially the going price established by the competitive market.

"Petroleum prices are the expression of the public's desire for products and for new facilities to provide additional products. They will be high enough to exclude those firms whose costs are too high and whose added production is not needed."

Both Holman and Dunlop foresaw a slackening in the increase in demand which has been continuous since the war.

Expansion May Lessen

"I believe it is now beginning to appear that the tremendous rate of expansion which has been required of the industry may lessen somewhat," Holman said. "We think that the demand for petroleum will continue to rise, but that the rate of increase which has marked the postwar years may taper off. If that judgment should prove correct, it follows that demand for new capital formation in the petroleum industry may level out."

In similar vein, Dunlop told the committee that "although it is perhaps too early to be definite about it, we may be entering the final phase of economic cycle, with supply outrunning demand and reductions of oil prices and oil profits in prospect. In my opinion there is much evidence to support this point of view."

Whether the increased profits of the oil industry are evidence of a healthy economic situation remains to be seen in view of the attendant circumstances, Dunlop said, "for to be properly appraised, these earnings must be related not only to the general economic situation, the general oil supply-demand picture, the purchasing power of the dollar, but finally and most importantly, to the obligations (involving replacement and expansion problems) resting on the industry to supply the oil needs of the consuming public."

Dunlop pointed out that plant replacements and expansions today cost twice as much as before the war, an extremely serious problem for the petroleum industry where capital investment per employe and per dollar of annual sales is substantially greater than in other industries.

At the same time, he said, while current depreciation allowances recognized by the Internal Revenue Bureau are sufficient to recover the original cost of plant construction, they are grossly inadequate to provide for its replacement at today's prices, yet "failure of industry to replace and keep modern and efficient its existing facilities means retrenchment, less production, fewer jobs, and

a consequent inability to meet customer demand."

Capital expenditures by the industry during the past 2 years averaged more than $2,000,000,000 annually, Dunlop continued, and "were it not for the fact that petroleum-industry profits have been rising, the source of funds for the replacement and expansion reflected by this huge capital expenditure would create a critical problem.

"There is no room for doubt but that adequate profits, in this industry as well as others, must exist in fact or in promise before replacement or expansion of facilities will occur," he said. "A tax which confiscated profits as being 'excessive' would have almost the same effect as a law which directly prohibited further industrial expansion.

"Already the talk of a so-called excess-profits tax is proving a disruptive force. . . . The matter of rising costs is a serious problem taken by itself, but add to that the reported prospect of an excess-profit tax, and no person in my position could help having grave misgivings about our expansion program. I am frank to state that if Congress should pass an excess-profits tax, all plans for expanding our company would immediately have to be reconsidered."

Restrictive Control Is Unwise

Inflation, Dunlop declared, has resulted in widespread misunderstanding of corporate profits which no longer can be adequately gaged by customary accounting procedures, and this inflation, he charged, is a direct result of the overexpansion of money supply resulting from loose monetary policies and the Government's continued deficit financing.

"To me, as I imagine to every executive of a competitive American business, the economic principles that I have attempted to elucidate are in fact nothing less than workaday laws we are forced to observe as surely as we observe the law of gravity," Dunlop said. "Efforts to dismiss these principles as mere schoolboy prattle or as being no longer appropriate to present business conditions are, to say the very least, extremely unwise.

"The oil industry is a monument to the workability of the doctrine of the free, competitive market and the American individual - private - enterprise system. One does not have to be a very keen student of this industry to comprehend that market forces are effective in bringing about economic adjustments that result in an ever-increasing flow of petroleum products to the American consumer.

"It is because my association with the oil industry has convinced me of the truth of these assertions that I take an unqualified stand against restrictive control and regulation of this and other competitive industries.

"Let petroleum remain free and unfettered, subject to the laws of economics and the corrective forces of the market place, and the oil industry will continue to serve the best interests of the American people, helping to raise their standard of living and to insure their national security."

Sawyer Advises U. S. to Keep Export Controls

WASHINGTON. — Continuation of all export controls now on the books was strongly recommended last week by Commerce Secretary Charles Sawyer.

"These controls," Sawyer said in his quarterly report on their administration, "are still needed for the same basic reasons as in mid-1947, when the Second Decontrol Act was passed—to help check the inflationary effects of supply shortages in the domestic economy and to help fulfill our international responsibilities."

Despite steady gains in national production since the end of the war, the supply of many commodities is still inadequate to meet the combined demands of foreign and domestic buyers, Sawyer pointed out.

Sawyer's report showed that less than one-third of our exports of oil and products, by value, is under export control—$54,997,000 worth out of a total of $180,628,000 in the second quarter of this year.

During that quarter, Canada took oil and products valued at $56,074,000, all free of control, while controlled exports to other North American destinations amounted to $11,783,000 out of a total of $18,981,000; to South America, $4,105,000 out of $12,622,000; ERP countries, $28,199,000 out of $56,472,000; Eastern Europe, $369,000 out of $658,000; other countries in Europe, $5,000 out of $2,026,000; Asia and Oceania, $7,746,000 out of $22,729,000; and Africa, $2,790,000 out of $11,066,000.

Lube Oil Exceeds Prewar Export

Tracing the trend of exports of crude and the major products, Sawyer showed that only lubricating oil, not under export license, is being exported in a volume greater than before the war. Exports of products under positive list control in the first 9 months of this year were substantially below the 1947 average and even further below the prewar level, he reported.

Third-quarter exports of crude were 11,101,000 bbl., or 2.1 per cent of supply, compared with an average for 1947 of 11,465,000 bbl. quarterly, or 2.3 per cent of supply, and a 1939 average of 18,016,000 bbl. quarterly, or 5.6 per cent.

Third-quarter exports of motor fuels and gasoline, kerosine, gas oil and distillate, and residual oil were 17,476,000 bbl., or 3.8 per cent of supply, against 19,228 bbl. per quarter in 1947, or 4.3 per cent, and 22,525,000 bbl. per quarter in 1939, or 7.4 per cent.

On the other hand, the report showed, the third-quarter exports of uncontrolled lubricating oil were 3,198,000 bbl. against 2,924,000 bbl. per quarter in 1939, but even here the percentage of supply was lower, 25.4 against 28.7. The 1947 quarterly average export was 3,465,000 bbl., or 26.9 per cent of supply. It was pointed out, however, that lubricating oil is produced in ample supply and there has been no need for some time of considering export control.

Brown Says Oil Imports Are a Critical Problem

WASHINGTON.—Charging that the economics advisory committee of the Interstate Oil Compact Commission apparently based its estimates of imports on plans of the importing companies to increase the inward flow of foreign oil, in its report on supply and demand in 1949, Russell B. Brown, general counsel of the Independent Petroleum Association of America, declared last week that "whether imports will supplement, or displace, domestic oil production is no longer a theoretical question" but a "practical problem confronting the industry and the oil-producing states today."

In a report to I.P.A.A. President Fred W. Shield, Brown pointed out that the commission committee and the I.P.A.A. supply and demand committee differed widely in their estimates of the imported oil that would be required next year, and asserted that the method of forecasting followed by the former "results in domestic production requirements being merely a balancing figure to supply the additional oil needed to meet demands" and places the domestic industry in the position of supplementing foreign supplies.

Whereas, under the compact committee's method a dealing with imports it would be necessary to cut back domestic production by more than 200,000 bbl. daily during the first quarter of next year, the I.P.A.A. report recommended that imports be reduced to 440,000 bbl. daily, he explained.

"This situation poses important policy questions on which immediate action will have to be taken if waste is to be avoided," Brown said. "Will importing companies continue to increase their shipments of foreign oil into the United States markets? Will the oil-producing states accept this departure from stated industry policy? The decisions on this matter are of great significance to the future of the independent producers in this country."

International

WORLD-WIDE OIL DEVELOPMENTS

Hungarians Use Harsh Language In Refuting U. S. Seizure Protest

THE Communist-controlled Hungarian Government last week rejected the United States Government protest over seizure of the Hungarian affiliate of Standard Oil Co. (N.J.) and treatment of officials of the company.

Rejection of the protest was expected, but the language of the reply was unusually harsh. The Hungarian Government took the occasion to attack American judicial methods and in its announcement in Budapest declared that "the United States State Department had better mind its own business."

In September, the Hungarian Government arrested Paul Ruedemann, Hartsdale, N. J., president of Jersey's affiliate, Hungarian American Oil Co. (MAORT), and George A. Bannantine, St. Louis, a director, charging them with "economic sabotage" in allegedly hindering oil production. They were subsequently freed and returned to the United States.

Planned to Justify Confiscation

This and other actions of the Hungarian officials have been generally viewed as a plan to justify confiscation of the properties. The U. S. State Department criticized the case against the company as false and fraudulent, but earlier this month, a Hungarian court gave a death sentence to the Hungarian chief geologist of the company and prison terms to two other officials, also Hungarians *(The Oil and Gas Journal, December 9, page 50, and December 16, page 61).*

Replying to the U. S. protest, the Hungarian Government called attention to "an interesting and characteristic feature of the American note—the fact that, along with the official document, a memorandum was delivered from the Standard Oil Co."

"Though we knew that big business . . . had a decisive influence in the American State Department, we were surprised to be offered the mendacities and distortions of this company as a state document," the Hungarian statement said.

Other statements in the Hungarian reply showed that controversy over the oil company is tied to the broader conflict between the two governments. Countering the U. S. declaration that Hungary would be held liable for the value of the properties, the Hungarian Government said it "reserved the right to compensate itself for damages caused to Hungary by the U. S. Government and for Hungarian property (in the U. S. zone of Germany) retained by the American Government, by making use of American property in Hungary.

As for the U. S. charges that police-state methods were used against the MAORT officials, the announcement of the Hungarian Government asserted "the notorious 'third-degree' method of torture, known far beyond the borders of the United States, does not justify such an allusion."

Creole Maracaibo-Amuay Line Put Into Operation

CRUDE oil began flowing December 14 through Creole Petroleum Corp.'s Maracaibo-Amuay Bay 24 and 26-in. pipe line, thus marking the beginning of operations in what is at present the world's largest crude line.

About 170,000 bbl. daily is being moved initially through the 145-mile line, and Creole hopes to reach full capacity of about 300,000 bbl. daily early next spring.

The line, which cost approximately $37,000,000, was built partly to supply the new Creole refinery now under construction at Amuay Bay and scheduled to go in operation in about 2 years. Until completion of the plant, crude moved through the line will be shipped by tanker from loading facilities at Amuay Bay.

The Creole pipe line begins at Ule, 3 miles north of Lagunillas where the company has a large tank farm. It extends through Dabajuro and under the Golfete de Coro to Amuay Bay on Paraguana Peninsula. Its 24 and 26-in. pipe give it the record for size, though it ultimately will be exceeded by the Trans-Arabian Pipe Line 30 and 31-in. project now under construction in the Middle East.

Some difficulty in laying the Creole line was encountered from tides in the 15-mile crossing at a maximum depth of 20 ft. of water in the Golfete de Coro. Construction, however, proceeded to the scheduled December completion date.

Pump stations are located at Ule and Dabajuro, each with 7,600 total pump horsepower. Williams Brothers had the contract for both the line and the two pump stations.

Construction of the basic foundations and auxiliary facilities, such as docks, is under way at the site of Creole's Amuay Bay refinery. This plant is scheduled to have a capacity of 60,000 bbl. daily.

Sinclair Panama Will Drill Test Near Puerto Armuelles

Sinclair Panama Oil Corp. is making preparations to spud in its second wildcat test on its concession in Panama early in January.

The location is near Puerto Armuelles on the Pacific side in the Province of Cherique. The test will be drilled only a short distance from tidewater.

The company's first test on Colon Island off Bocas del Toro was abandoned at between 8,000 and 9,000 ft. after heaving shale was encountered. The rig being used in the exploration is rated at 15,000 ft.

Considerable geological work is being carried on by the company over its concession of approximately 17,760,000 acres. Sinclair Panama, owned by Venezuelan Petroleum Co. (Sinclair) and Cities Service Co., obtained the 20-year concession in 1946 from the Republic of Panama and by September 1949 is to select, if it so wishes, acreage which it wishes to retain for development.

Rebuilt French Refineries Now Producing Beyond Expectations

THE French refining industry, which has made remarkable progress in regaining and exceeding its prewar capacity, is now processing crude oil at the 10,000,000-ton-a-year rate originally set as the goal to be reached in 1951.

According to reports from Paris, crude actually processed during the second quarter of 1948 was 2,269,000 tons, or about 176,000 bbl. daily, using the rough conversion factor of 7 bbl. per ton.

The increasing throughput of the French plants is shown by the fact that during the first quarter of 1948 runs totaled only 1,383,470 tons, or about 107,000 bbl. daily.

The 10,000-ton-a-year goal had been set up for the refining industry in the country's postwar Monnet plan which outlined a program of over-all French industrial recovery. This figure equals about 192,000 bbl. daily.

Estimate Based on July Capacity

French officials said capacity of the industry reached 11,175,000 tons last July, or about 215,000 bbl. daily, and predicted nominal refining capacity would be 12,000,000 tons a year, or about 230,000 bbl. daily, by January. They pointed out, however, that both quantity and quality of gasoline production would suffer if the refineries were operated at this high rate in view of their present state of reconstruction.

Although, in general, the French refining industry is operating at a rate considerably above expectations, another Paris report indicated that throughput in September alone was somewhat below the rate for the second quarter of the year. Oil processed in French refineries in September totaled 632,801 tons, or about 148,000 bbl. daily.

Production of the refineries in that month was: gasoline, 142,170 tons; kerosine and light distillate, 24,027 tons; gas oil, 102,151 tons; fuel oil, 302,714 tons; lubricating oils 14,288 tons; bitumen, 37,197 tons; and other products, 4,651 tons.

Reports on the status of the refining industry, not only in France but elsewhere in Europe, show that processing facilities surpassing those of the immediate postwar years, are in prospect. Aided by the Marshall plan and realizing the necessity of petroleum in their economics, western European countries are building a large new refining industry. Most of the new and reconstructed plants are designed to operate on Middle East crude.

France imported a total of 775,957 tons of crude oil in September of which about 48 per cent came from the three Middle East producing countries of Arabia, Iraq, and Iran. The September crude-oil imports were at a rate of about 175,000 bbl. daily and represented an increase of 108,045 tons or about 16 per cent over October crude imports.

Of the October crude imports, the following quantities in tons were supplied as follows: Sandi Arabia, 142,780; Iraq, 143,144; Iran, 89,489; other Asiatic countries, 175,146; United States, 35,435; Mexico, 15,708; Venezuela, 149,769, and West Indies, 24,483.

Products Imports Still Heavy

France is continuing to import sizable quantities of products. The United States is supplying much of the aviation gasoline and lubricants. Other products are coming largely from plants in the Middle East area and in the West Indies.

The following table (with quantities in tons) gives the amounts of products imported in October and September.

Product—	October	September
Aviation gasoline	3,369	2,861
Motor gasoline	29,245	15,344
Gas oil	6,120	7,487
Kerosine	10	23
Distillate fuel oil	3	764
Heavy fuel oil	15,099	18,906
Lubricating oil	9,024	7,892

Hydrogenation Plants in Germany to Be Restored

BRITISH and United States officials in Germany have authorized the restoration of hydrogenation plants at Wesseling and Gelsenberg. When operating at full capacity the two plants will meet nearly half the present petroleum-products requirements in the western occupation zones.

The plants will be operated by three oil companies under agreements with the German companies. Crude oil from Kuwait and Saudi Arabia under the Marshall plan will be treated in distillation units at the plants and the residue subjected to high-pressure hydrogenation.

Deutsche Vacuum Oel, A.G. (Socony-Vacuum) and Deutsch-Amerikanische Petroleum-Gesellschaft (Jersey Standard) have made arrangements with Gelsenberg Benzin, A. G., covering the Gelsenberg plant, and a similar agreement has been reached between Deutsche Shell, A.G., and Rheinische Braunkohlen Kraftstoff, A.G., for Wesseling, according to reports from Hamburg.

Full operation of the two plants is expected by next April. They will process about 800,000 tons annually (about 16,000 bbl. daily). Gasoline production will be sharply increased through the hydrogenation of the 40-50 per cent residue from the topping operations.

Permits for the operation of these Rhineland plants were approved in June of this year by the Bipartite Control Office but protests on higher Allied levels caused a delay in the final authorization.

Capacity Approaches Consumption

Anticipated production of about 800,000 tons a year from the two hydrogenation plants compares with a consumption of petroleum products of 799,492 tons in the bizone area of Germany, including Berlin, in the first half of 1948. Consumption in the second half of 1948 is expected to be somewhat higher. Of consumption in the bizone area, in the first half, 303,691 tons consisted of diesel fuel, and 246,618 tons of motor fuel.

First-half 1948 figures on the production of German refineries, all located in the British zone except for one small topping plant in the United States zone, show a total of 316,356 tons of petroleum products. This corresponds to about 13,000 bbl. daily. Lubricating-oil production was especially high, listed at 87,412 tons for the first half period, or about 3,590 bbl. daily. Motor-fuel production was 36,152 tons, or about 1,480 bbl. daily.

Saudi Arabian Production Continues Upward Trend

Crude-oil production in Saudi Arabia continued its steady upward trend in November, the daily average output rising to 481,796 bbl. daily. This represents an increase of 13,069 bbl. daily over production in October.

Arabian American Oil Co. announced total production in November amounted to 14,453,870 bbl. Crude processed at the company's refinery at Ras Tanura in November totaled 3,738,453 bbl., or an average of 124,615 bbl. daily. Crude-oil production the first 11 months of 1948 amounted to 128,395,370 bbl., an average of 384,417 bbl. per calendar day. Crude run in the refinery the same period was 41,426,177 bbl., an average of 124,030 bbl. per calendar day.

One of the two-bedroom family homes built by Bahrein Petroleum Co., Ltd.

Bahrein Petroleum Maintains Modern City for Employes on Bahrein Island

BAHREIN PETROLEUM CO., LTD., which pioneered facilities for employe comfort and welfare in the Middle East in the middle 1930's, is continuing the construction of dwellings and other employe facilities, and has plans for a large program in 1946. Much work of this nature was necessarily deferred during the war, and this, along with expanded operations, has resulted in the program now under way.

Although oil had been found in Iran as early as 1908, no really great development can be said to have taken place until the late 1920's and early 1930's, when United States geologists resurveyed Bahrein Island in the Persian Gulf and found what they considered to be oil reserves sufficient to make large-scale commercial operations worth while. The first well brought in on Bahrein Island in 1932 flowed at some 100 bbl. per hour at 2,000 ft.

Sitrah Terminal Is First Step

Projects for the refinery were immediately initiated, and transportation arranged by developing a terminal on nearby Sitrah Island, connected to Bahrein by means of a submarine pipe line. To deal with the anticipated expansion of this project, Bahrein Petroleum Co., Ltd. (Bapco), was formed to produce and refine oil lying within its concession of over 100,000 acres on the island. The task of obtaining, transporting, and building the equipment necessary for a project of this size in a land of desert wastes can scarcely be imagined. Everything required had to be shipped halfway around the globe. Yet the whole basic job was completed in 17 months, and Bapco was under way. By 1936 the first refinery units were completed with a throughput capacity at that period of about 25,000 bbl. per day. Additional units have been added as required, and today the throughput capacity is about 150,000 bbl. per day.

It was essential to create a city for European and American staff, and for this purpose the town of Awali was chosen since it lay near the center of the island at the northern edge of the oil fields and was several miles distant from the nearest Bahrein village or cultivated area, and 13 miles from the native capital, Manama. So Awali sprang up, with the original units including main office, shops, stores, commissary, hospital, mess hall, residential and recreational areas, all forming a complete and self-sufficient community in itself.

With these original units came the need for recreational facilities, and the first activities in this line provided a golf course, swimming pool, and tennis courts, followed later by facilities for such sports as squash, baseball, field hockey, and badminton. The good fishing and sailing attracted good numbers of personnel. Free bus service was provided and a cinema made available. Special attention was given to recreational facilities for the wives and children of employes.

The addition of these units meant increased personnel, and with that personnel, additional housing, recreational, and educational facilities. The first housing project dates from 1935, at which time 36 five and six-room cottages were under construction. At the present time, several new buildings which will add greatly to the comfort and morale of personnel are under construction in Awali. These include a large new office building, a new guest house, industrial shops, automotive, carpentry, and paint shops, and a theater. The theater, which is designed for cinema, plays, concerts, and pageants, both indoors and outdoors, has a seating capacity of 600 on the orchestra floor, with a balcony level seating 300 to be added at a later date. For outdoor showings, an audience of 1,000 can be accommodated.

Additions Planned for Next Year

Varied additional facilities for recreation planned for next year at Awali will be composed of a library, recreation hall, swimming pool, baseball diamond, squash courts, tennis courts, bowling alleys, assembly hall, and children's playground.

As the European population on Bahrein increased, it was obvious that suitable educational facilities must be created for the children. The first formal school was opened in 1938 with one teacher providing the instruction for four students. Today there is a schoolmaster acting as supervisor of education, aided by three teachers, who handle the instruction of about 75 students.

From the point of view of education of Bahreini personnel, a tremendous obstacle had to be faced. Bahreinis had, for centuries, been untouched by industry and commerce as we know it, and were strictly a pastoral desert people and, in some

cases, pearl divers. This meant that each Bahreini hired had to serve an apprenticeship under European tutelage in order to perform the simplest mechanical operations. Carpenters, welders, and all other workers had to be trained for their jobs from the very outset. As they increased in efficiency, they were promoted to greater responsibilities and provided with further informal, but direct, training.

A new school village has been created at Zellaq, about 5 miles from Awali, to increase the skills of some 30 to 40 Bahreinis especially selected for possibilities of development. These Bahreinis receive full pay while attending the school, and are transported to and from the village by the company. There is also a regular trade school where employes wishing to learn maintenance and construction skills may obtain special instruction.

Natives Profit Too

As can be imagined, much has been done for the native population from many points of view. In reference to hospital and medical facilities, they have been enlarged to the extent that in 1 week 170 in-patients and 2,450 Bahreini out-patients were handled. To improve their health, Bahreini workers also receive a free monthly ration of 9 lb. of rice and 12 lb. of flour to augment their regular diet. New housing is also gradually replacing native huts, greatly improving morale.

From the very beginning of company operations on Bahrein Island, it was realized that every possible precaution must be taken to safeguard the health of the employes. For this reason, modern hospital facilities were among the first to be constructed and staffed with the finest available doctors and nurses. Some 30 beds were provided for European personnel, and the new east wing for Bahreini personnel has doubled this capacity for in-patients.

Sanitary measures of wide scope were undertaken at the outset to minimize illnesses due to tropical diseases and infections with resultant fevers. Today all offices, control rooms, and toilets in the refinery are sprayed with residual D.D.T., as are all bungalow verandas, mess halls, clubs, house boys' and laborers' quarters, and, where Bahreini elders will permit, Bahreini villages are also sprayed. Fly and rat control also receive regular consideration, and improved garbage containers and disposal methods have contributed greatly to decrease both the fly and rat population.

Since malaria was the most serious from the point of view of man-days lost, a full-scale campaign for malaria control and suppression was launched in 1946, under the direction of the medical department, entomological and sanitary engineers' staff especially chosen for this work. This combined team attacked the problem on all fronts and has made an amazing record in decreasing the incidence of malaria and time loss among both staff and nonstaff personnel over the past 2 years. Every modern technique has been used to accomplish this splendid result. The success of the antimalaria campaign may be judged by the fact that loss of man-days of nonstaff due to malaria decreased between 60 and 75 per cent from 1946 to 1947, and reports during 1948 indicate that with constant effort and education, malaria can be reduced to a minor cause of illness among the inhabitants of Bahrein Island.

The population of Bahrein Island now includes 1,205 Europeans, of whom 841 are employed by the company, the remainder being wives and children and construction help, and 5,838 Bahreinis employed by the company.

Ecuadorian Action Will Expedite Oil Development

Action of the Ecuadorean Senate in authorizing the president to negotiate concession contracts was generally interpreted as a step which would expedite exploration and development work in the country.

Companies affilated with Standard Oil Co. (N.J.) and the Shell organization have plans for further work in Ecuador. Esso Standard Oil Co. of Ecuador and Shell Oil Co. of Ecuador have joined in exploration surveys of the eastern part of the country, and under concession proposals, the companies may transfer among themselves any of their rights.

International
WORLD-WIDE OIL DEVELOPMENTS

Aramco To Move Main Offices to New York

ARABIAN AMERICAN OIL CO. is making plans to transfer its present main headquarters from San Francisco to New York.

Although the company itself made no statement regarding the move, Uris Brothers announced last week that Arabian American had signed a long-term lease for all but the ground floor of a 21-story air-conditioned building Uris company is constructing at 505 Park Avenue in New York. Three of Aramco's four parent companies under the stock purchase to be formally consummated this month are located in New York. They are Standard Oil Co. (N. J.), The Texas Co., and Socony-Vacuum Oil Co., Inc.

The fourth partner is Standard Oil Co. of California. Prior to the acquisition of a 30 and 10 per cent interest by Jersey Standard and Socony-Vacuum, Aramco was owned equally by California Standard and The Texas Co.

This move would involve the transfer of more than 700 persons and would include such major departments as production, refining, marketing, and accounting.

The moving of Aramco's headquarters would place the company's main office in the same city as owners of 70 per cent of its stock and would bring it closer from the standpoint of distance to its fast-developing operations in Saudi Arabia.

A view of some of the existing housing accommodations in Bahrein

Oil Exports Kept at Present Rate In Quotas for First 1949 Quarter

WASHINGTON. — Quotas for first-quarter, 1949, exports of petroleum and products and casing and line pipe have been set by the Office of International Trade at same levels as for the current quarter.

The oil quotas provide for the export of 2,000,000 bbl. of crude oil, 1,570,000 bbl. of aviation motor fuel and 4,710,000 bbl. of other motor fuel, 450,000 bbl. of kerosine, 4,000,000 bbl. of gas oil and distillate, and 1,450,000 bbl. of residual fuel oil. Whether any changes will be made in these quotas during the quarter, as was done in November when an additional 1,000,000 bbl. of residual fuel oil was announced, was not disclosed.

The steel quotas provide for the export of 70,000 short tons of seamless and 37,000 tons of welded casing and line pipe.

Over-All Quotas Unchanged

While the over-all petroleum quotas remained unchanged, there were some modifications in the allocations for various countries, which were set up as follows:

ECA countries: Belgium and Luxembourg, 160,000 bbl. motor fuel, 140,000 bbl. gas oil and distillate; Denmark, 160,000 bbl. motor fuel, 8,000 bbl. kerosine, 140,000 bbl. gas oil and distillate, 80,000 bbl. residual fuel oil; France, 850,000 bbl. crude oil, 190,000 bbl. aviation gasoline; Greece, 120,000 bbl. aviation gasoline; Italy, 60,000 bbl. aviation gasoline; Netherlands, 16,000 bbl. kerosine, 200,000 bbl. gas oil and distillate; Norway, 110,000 bbl. motor gasoline, 20,000 bbl. kerosine, 100,000 bbl. gas oil and distillate; Portugal, 20,000 bbl. aviation gasoline, 30,000 bbl. motor gasoline, 10,000 bbl. kerosine, 10,000 bbl. gas oil and distillate; Sweden, 250,000 bbl. motor gasoline, 50,000 bbl. kerosine, 220,000 bbl. gas oil and distillate; Switzerland, 75,000 bbl. motor gasoline, 5,000 bbl. kerosine, 100,000 bbl. gas oil and distillate, 40,000 bbl. residual fuel oil; United Kingdom, 110,000 bbl. crude oil, 305,000 bbl. aviation gasoline, 1,000,000 bbl. motor gasoline, 80,000 bbl. kerosine, 850,000 bbl. gas oil and distillate.

ECA territories: British West Africa, 18,000 bbl. aviation gasoline, 40,000 bbl. motor gasoline, 15,000 bbl. kerosine, 60,000 bbl. gas oil and distillate; French North Africa, 35,000 bbl. aviation gasoline, 65,000 bbl. motor gasoline, 65,000 bbl. gas oil and distillate; French West Africa, 15,000 bbl. aviation gasoline, 75,000 bbl. motor gasoline, 15,000 bbl. kerosine, 20,000 bbl. gas oil and distillate; French Oceania, 10,000 bbl. motor gasoline, 3,000 bbl. kerosine, 20,000 bbl. gas oil and distillate; Netherlands West Indies, 370,000 bbl. gas oil and distillate.

Latin America: Argentina, 340,000 bbl. crude oil; Bolivia, 6,000 bbl. gas oil and distillate; Brazil, 10,000 bbl. aviation gasoline, 180,000 bbl. motor gasoline, 20,000 bbl. kerosine, 100,000 bbl. gas oil and distillate; Costa Rica, 15,000 bbl. motor gasoline, 3,500 bbl. kerosine; Chile, 75,000 bbl. gas oil and distillate, 90,000 bbl. residual fuel oil; Cuba, 450,000 bbl. crude oil, 35,000 bbl. aviation gasoline, 450,000 bbl. motor gasoline, 2,000 bbl. kerosine, 50,000 bbl. gas oil and distillate, 240,000 bbl. residual fuel oil; Guatemala, 12,000 bbl. motor gasoline, 3,000 bbl. kerosine, 5,000 bbl. gas oil and distillate; Mexico, 20,000 bbl. crude oil, 12,000 bbl. aviation gasoline, 500,000 bbl. motor gasoline, 15,000 bbl. kerosine, 30,000 bbl. gas oil and distillate, 300,000 bbl. residual fuel oil; Nicaragua, 15,000 bbl. gas oil and distillate; El Salvador, 40,000 bbl. motor gasoline, 2,000 bbl. kerosine, 7,000 bbl. gas oil and distillate.

Other: Australia, 8,000 bbl. aviation gasoline, 135,000 bbl. motor gasoline, 20,000 bbl. kerosine, 175,000 bbl. gas oil and distillate; New Zealand, 10,000 bbl. aviation gasoline, 240,000 bbl. motor gasoline, 8,000 bbl. kerosine, 50,000 bbl. gas oil and distillate; Union of South Africa, 25,000 bbl. motor gasoline, 5,000 bbl. gas oil and distillate China, 200,000 bbl. aviation gasoline, 300,000 bbl. motor gasoline, 60,000 bbl. kerosine, 200,000 bbl. gas oil and distillate, 10,000 bbl. residual fuel oil; Japan, 100,000 bbl. motor gasoline, 25,000 bbl. kerosine, 100,000 bbl. gas oil and distillate, 100,000 bbl. residual fuel oil; Philippines, 15,000 bbl. aviation gasoline, 225,000 bbl. motor gasoline, 30,000 bbl. kerosine, 150,000 bbl. gas oil and distillate, 80,000 bbl. residual fuel oil.

Products Set Aside for Projects

The OIT set aside for special projects 70,000 bbl. aviation gasoline, 15,000 bbl. motor gasoline, 2,000 bbl. kerosine, 140,000 bbl. gas oil and distillate, and 340,000 bbl. residual fuel oil, and held in the undistributed reserve 230,000 bbl. crude oil, 447,000 bbl. aviation gasoline, 498,000 bbl. motor gasoline, 37,500 bbl. kerosine, 597,000 bbl. gas oil and distillate, and 80,000 bbl. residual fuel oil.

Destinations for the casing and line pipe were not announced, but in seamless, 65,000 tons was held for projects and 5,000 tons for commercial shipment and in welded, 34,500 tons was reserved for projects and 2,500 tons assigned for commercial shipment.

O.I.I.C. Adopts 1949 Objectives at Meeting

THE Oil Industry Information Committee at its meeting in Rye, N. Y., December 7 determined to place greater emphasis, in the coming year, on getting participation in its information program by oil marketers who are in direct contact with the consuming public.

District committees of O.I.I.C. adopted the following objectives of operation for 1949: To advance the common interest of all oil men in maintaining a competitive industry to serve the public; to increase the knowledge among oil men of the social significance of functions performed by their industry; to further the public understanding of the oil business and of the people in the industry.

Specific immediate objectives adopted are to increase understanding of how the public benefits from: Industry's constant and extensive research and its progressive development of improved and new products and services; competition within the industry, evidenced in the price and quality of products and in services offered; oil industry's widespread system of distribution and supply whereby many local units and individuals compete in serving customers and their communities; industry's constant efforts to discover, conserve, and extend petroleum reserves; progressive and constructive use of earnings and credit to expand facilities to meet fully America's demand for petroleum products and services; work of the oil industry by helpful assistance and advice regarding the wise and efficient use of petroleum products.

Army Is Moving Anhydrous Ammonia Plant to Houston

HOUSTON. — Another chemical plant for the Gulf Coast area to produce anhydrous ammonia which will be made into ammonium sulphate fertilizer was announced last week.

A plant operated at Louisiana, Mo., during the war is being moved by the army to the San Jacinto Ordnance Depot in Houston. It will be operated by Hercules Powder Co.

Natural gas is the principal raw material in the manufacture of anhydrous ammonia. In case of war, the ammonia can be made into nitrate materials for explosives. The first unit of the plant is expected to be in operation by late summer or early fall of 1949.

Texas A.I.M.E. Sections Discuss Recovery and Completion Methods

by D. H. Stormont

AUSTIN. — Primary and secondary oil-recovery methods, along with developments in well-completion techniques, were the dominant themes at the annual joint meeting of Texas sections of the American Institute of Mining and Metallurgical Engineers held here at the University of Texas December 16-17. More than 300 oil-industry personnel and students from Texas University and A. & M. College of Texas were in attendance at the technical sessions.

The three topics covered in the completion session were plugging agents, jet perforating, and casing packers. Papers relating to recovery methods dealt with projects under way in Goldsmith and Pickton fields of Texas and Cotton Valley field of North Louisiana, problems resulting from unitization of oil-field properties, a study of the Hugoton field of Kansas, and methods of forecasting the amount of oil recoverable by primary and secondary operations.

A. A. Townsend of Dowell Incorporated, Tulsa, covered the first topic in his paper, "Applications of Surface Plugging Agents in Oil and Gas Wells." The principal applications discussed by Townsend were for (1) testing of various potential producing zones during the drilling of a well, (2) with plastics for sealing off the entry of undesirable fluids into a well, (3) in selective acidizing, and (4) for plugging the bottom of a well to prevent acidizing into bottom water. New applications for surface-plugging materials continue to be recognized, he pointed out, their use allowing the performance of many remedial operations which otherwise would be commercially unfeasible.

Casing Packers Described

In "Fundamental Hydraulics Involved in the Use of Oil-Well Packers," Jack C. Webber of Atlantic Refining Co. pointed out that the successful use of packers requires an understanding of the pressures which exist at the packer in various applications, and an understanding of the characteristics of the various types of packers available. He first described the various types of casing packers available and discussed the pressures forces acting on the conventional, universal, and special-type packers. He then presented examples of packer applications which emphasized the many salient features which must be considered in the use of packers. These included the effect of swabbing, effect of unbalanced valve area, effect of gas wells, effect of upwardly acting differential pressure on conventional and universal packers, and the effects of squeeze-cementing pressures. In each example he discussed all the pressures and resultant forces involved.

"Jet Perforating of Oil-Well Casing," was discussed by R. H. McLemore of Well Explosives Co., Fort Worth. He described the principles involved in the use of shaped charges, and discussed the most recent development in their use for perforating casing.

Recovery Prediction Graphs Offered

George R. Elliott and W. L. Morris of Phillips Petroleum Co., Bartlesville, Okla., in their paper "Oil Recovery Prediction," presented graphs for use in preliminary predictions of oil recovery from solution-gas-drive reservoirs. One chart presented permits the primary recovery, in barrels per acre-foot, to be read from a nomograph based on viscosity, shrinkage, connate water, porosity, and permeability. A second nomograph given predicted the combined total of primary recovery and oil "available" for secondary recovery.

To reduce the oil available for secondary operations to a prediction of oil recoverable from a water-flooding project, some factor may be applied, the authors stated. This factor will involve the relative effectiveness of a water-flooding project after solution-gas primary depletion, as compared to a natural water drive with original gas in solution, it was pointed out.

"Conserving Reservoir Displacement Fluid While Operating an Experimental Gas Injection Project," by J. A. Slicker of Stanolind Oil & Gas Co., Fort Worth, dealt with a six-lease experimental gas-cap injection project in the Goldsmith field of West Texas. A brief review of the field and of reservoir characteristics were first given, followed by a description of the project's operation.

Field tests and research carried out in Cotton Valley field of Louisiana to determine the efficiency with which dry injected gas displaces wet gas in the reservoir were described by Ralph L. Hock of the Cotton Valley field operator's committee. This displacement efficiency has been found to be 88 per cent in the Bodcaw sand, Hock said. The ultimate economic cycling efficiency, a product of the displacement efficiency times the pattern efficiency, should by 74 per cent at Cotton Valley, it was pointed out.

Equipment and technology utilized to plot the progress of dry injected gas as it sweeps through the reservoir were described by Hock. Also the relation between time, injection rate, and well position to the rate of dry gas encroachment was fully presented.

Other Papers Presented

Three other papers along this general theme which were presented during technical sessions of the second day were: "Unitization and Its Engineering Problems," by Philip C. Dixon, consulting engineer of Houston; "The Hugoton Gas Field," by Jack Dougherty of DeGolyer & MacNaughton of Dallas; and "A Study of Oil and Gas Conservation in the Pickton Field," by J. R. Welsh, R. E. Simpson, J. W. Smith, and C. S. Yust, all of Humble Oil & Refining Co., Houston.

Walter Rogers of Gulf Oil Corp., Houston, presented one of the outstanding papers of the meeting, "Influence of Oil on Subsurface Corrosion of Well Equipment." The paper dealt largely with research and field work performed to determine the effects of water-oil ratio and the wetting power of oil and condensate in the occurrence of subsurface corrosion. In so far as water-oil ratios were concerned it was found in general that subsurface corrosion was not prevalent in Gulf Coast wells producing as much as 10 per cent oil; in West Texas, sour-gas wells producing 50 per cent oil. Wells producing crude oils which have a high wetability were found to have much less corrosion than those producing oil with low wetting power. Rogers also described research work done with preoiled equipment.

Drilling Development Discussed

In a session devoted to developments in the drilling phase of the industry, three papers given were: "Relation of Nozzle Fluid Velocity to Rate of Penetration With Drag Type Rotary Bits," by Douglas Ragland of Humble, Houston; "The Place of the Engineer in the Drilling Industry," by George P. Livermore, Lubbock; and "Current Trends in the Design of Rotary Drilling Equipment," by C. F. Van Loozen, International Derrick & Equipment Co., Torrance, Calif. In the absence of the author, the paper was presented by Ideco's E. F. Shields, Dallas.

More Conservation Powers Needed, Murray Tells Texas Association

by D. H. Stormont

ABILENE, Tex.—West Central Texas Oil and Gas Association members, in their semiannual membership and technical meeting here December 14, were told that broadened conservation regulations some day may permit the Texas Railroad Commission to close in any oil field where producing practices are such that they will not result in maximum ultimate oil recovery. These additional conservation powers were forecast by Commissioner W. J. Murray, Jr., and would be brought to pass principally by the weight of public opinion.

Commissioner Murray outlined progress which has been made in conservation of Texas natural gas, pointing out that while injunctions have been obtained against the recent commission order shutting in 17 oil fields because of gas wastage, in 15 of the 17 fields steps have been taken toward complete utilization of gas by July 1949. None of the operators in the 17 fields argued against the need for gas conservation, he said; they merely wished additional time to complete their gas-utilization programs.

Gas Conservation Overemphasized

In his opinion, however, gas conservation was being overemphasized and underground waste of oil not sufficiently emphasized. Improper production methods can waste millions of barrels of oil, much more valuable than gas, by leaving it in an unrecoverable condition in the ground, he said. Under a broadened oil-conservation program the commission would be enabled to call on the operators to show what steps are being taken, such as water flooding, repressuring, or pressure maintenance, and to show that the steps being taken do assure maximum ultimate recovery from the producing oil areas.

At the morning technical session other addresses heard were: "Causes and Costs of Industrial Accidents in Texas Oil Fields," by Ben H. Mitchell of the Texas Employers Insurance Association, Dallas; "Petroleum Production Research," by H. H. Power, chairman of the department of petroleum engineering at the University of Texas; and "Public Relations Outlook for 1949," by Paul Cain, Oil Industry Public Relations Committee, Dallas.

In the afternoon technical session G. H. Brodie, geologist of Abilene, spoke on "Interpretation of Shallow Structures"; M. G. Cheney, president of Anzac Oil Co., Coleman, on "Strawn Channel Sand Oil Fields and Their Production Problems"; and Gordon R. Stine, consulting engineer of Wichita Falls, on "Gas Repressuring in North and West Central Texas." Other papers in this session were: "Secondary Recovery Operations in the Cook Field of Shackelford County, Texas," by Paul Armstrong of Roeser & Pendleton, Albany; "Factors to Be Considered in Obtaining Proper Cementing of Casing," by G. C. Howard and J. B. Clark of Stanolind Oil & Gas Co., Tulsa; "Core Analysis Technique and Applications," by R. S. Bynum, Core Laboratories, Inc., Dallas.

At a banquet that evening Minor S. Jameson, Jr., economist for the Independent Petroleum Association of America, Washington, spoke on "Oil Facts Versus Fallacies." Also at the banquet session new officers for 1948 were elected. V. C. Perini, Jr., of Abilene was reelected president, French M. Roberston of Abilene was reelected first vice president, and J. F. West of Stamford was named second vice president to succeed Lester Clarke of Breckenridge.

Government Sues to Get Gulf Offshore Oil Title

WASHINGTON. — The Department of Justice this week filed its long-expected suit to seize the oil-bearing tidelands of Texas and Louisiana.

Seeking permission to file the case with the Supreme Court, Attorney General Tom C. Clark said the two states are "defying" federal rights by granting leases for the production of oil from pools underlying the submerged lands off their coasts.

Clark declared that the court's 1947 decision in the California case applied also to the states along the Mexican Gulf, although both Texas and Louisiana claim it was not binding on them.

While he admitted that Texas entered the Union under different circumstances than California, the attorney general maintained that "to the extent that any of those differences are relevant at all (to the tidelands issue) they point even more clearly to paramount rights in the United States."

Louisiana, he said, came in under conditions similar in all respects to those under which California became a state.

In the suit, the Government seeks to apply the "paramount" rights which the court said it had to the offshore California oil fields, to oil and other valuable resources underlying the Gulf of Mexico to a distance of 27 nautical miles off of Louisiana and to the edge of the Continental Shelf off Texas.

Clark told the court there has been extensive leasing of oil lands off the coasts of the two states since the California decision was handed down and said a specific ruling by the court is necessary to safeguard federal rights.

Filing of the suit has been expected for many months, Clark having told a Senate judiciary subcommittee during hearings last March on the bill to vest title to the tidelands in the states that the department was then preparing the case. The suit filed this week indicates that the department plans to march right across the Gulf states, proceeding next against Mississippi and possibly Florida.

Texas and Louisiana officials testifying before the Senate subcommittee last winter made an energetic effort to head off the case. Texas authorities contended that the state, having been an independent country before voluntarily coming into the Union, had never forfeited its rights to anything it may have held as a republic. That view, however, now is challenged by the Department of Justice.

Because of the time required for the preliminary moves, it is not expected that the court will be able to hear the case before next spring.

Steel Distribution, Topic Of NPC January Meeting

WASHINGTON.—First 1949 meeting of the National Petroleum Council has been called by Chairman Walter S. Hallanan for January 13.

New business to come before the council, he said, will include a request by Interior Secretary J. A. Krug for a study of "the problem of shortages, exportation and maldistribution of steel materials," on which a recommendation will be made by the agenda committee.

Only a few changes have been made in the membership of the council, most of them reflecting changes in the leadership of associations. New members include Max W. Ball, Washington, former director of the Oil and Gas Division; Harry B. Hilts, New York, Atlantic Coast Oil Conference; J. S. Morris, American Association of Oilwell Drilling Contractors; W. F. Sehmann, National Stripper Well Association; Fred W. Shield, Independent Petroleum Association of America; Guy I. Warren, Texas Independent Producers and Royalty Owners Association; and W. S. Zehrung, Pennzoil Co., Oil City, Pa.

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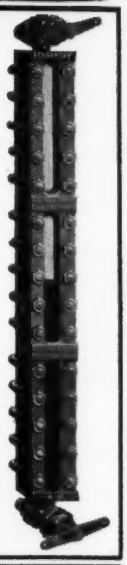

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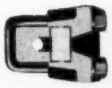

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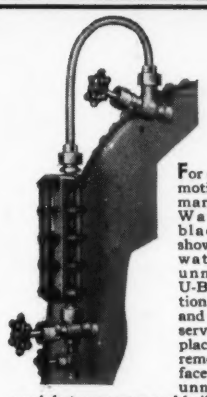
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

PENBERTHY

"REFLEX"

WATER GAGE SET



For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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PENBERTHY

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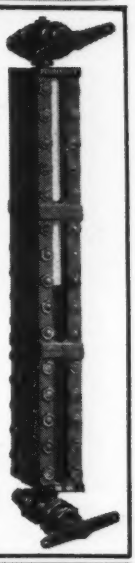
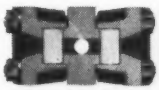
DROP FORGED STEEL LIQUID LEVEL GAGES



Used to observe color and density of liquids under high pressures and/or temperatures. Construction exceptionally sturdy. Made of alloy temperature resisting steel, and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Transparent" is one of the complete line of Penberthy gages that meet every liquid level gage requirement.



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GEOPHYSICAL SERVICE INC.

DALLAS, TEXAS

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Interior Views

WASHINGTON.—A change in the administration of the Interior Department won't bring with it any change in that department's thinking on oil—not if Under Secretary Oscar L. Chapman succeeds Secretary J. A. Krug, as is generally expected.

Both Chapman and Assistant Secretary William E. Warne had occasion to make their views known recently, and emphasized their belief that a strict, aggressive conservation program should be pressed to extend our reserves of nonrenewable resources.

Chapman is not happy over the current situation, where we are using oil at a greater rate than we are producing it, holding that such imbalance is not healthy from a national defense standpoint, which demands that we have oil that can be produced at a moment's notice.

Nor is he reassured by what he sees in the future, when a full-employment economy would increase the drain on our resources. In the next 10 years, it has been estimated, full employment will increase our consumption of oil, iron ore, salt, coal, and other nonrenewable resources, in some instances by as much as one-third.

The under secretary, who discussed the subject at a meeting of Washington women "voteless voters" (residents of the District of Columbia have no voting privilege), held out the prospects of synthetic liquid fuels as the answer to the oil problem.

The two department officials, incidentally, indicated there are other headaches in the resources picture just about as bad as oil. Water shortage on the West Coast is leading to serious consideration of methods of refining ocean water for domestic use; the country must face up to the need of tremendous additions to electric power supply; and it soon will be necessary to search Alaska for sources to supplement our dwindling reserves of iron ore and other metals.

Comatose Pact

BACK in 1944, the then Secretary of the Interior and Petroleum Administrator for War Harold L. Ickes, headed a crusade to London where, with due pomp and circumstance, what was known as the Anglo-American petroleum agreement was signed and sealed.

Unfortunately, when the agreement went to the Senate for ratification, the seal became unstuck and President Roosevelt had to recall it for retailoring because the domestic oil industry spotted a joker which might make it possible for a small group of government experts to dictate how much oil should be produced.

The revised but devitalized agreement went back to the Senate in about a year and was put in a special pigeonhole. Once or twice it managed to crawl out, but it always got pushed back, although in July 1947 it was reentombed only after the committee on foreign relations reported it could be ratified provided certain further changes were made in it.

For the past 18 months, the would-be world (including Russia) oil pact has been comatose. And it will Rip Van Winkle right along for another 12 months, for it is high on the committee's agenda of things not to be done during the coming session of Congress.

Sen. Tom Connally of Texas, who will become chairman of the committee in January (the job runs Connally to Vandenberg to Connally) isn't interested in the agreement. The State Department isn't interested, and while presumably Ickes is, he isn't in the administration any more.

A recent confidential report by the State Department on a number of foreign matters stated that "the department doesn't expect to seek agreement on this at this session."

"Suits me," allowed Connally.

What Price Defense

BEFORE election, President Truman set a ceiling of $15,000,000,000 on military expenditures for the coming fiscal year. Defense Secretary Forrestal reportedly sees a need for $17,500,000,000 to $18,000,000,000. The final decision will rest with Congress, and will determine whether the American economy is to be regimented, possibly for some years to come.

The President's economic advisers have warned him that $15,000,000,000 is the top military expenditure that can be supported without heavy increases in taxes. The military contend that United States' interests and commitments are now so widely spread around the world that we are practically in a state of limited emergency. Two other groups reportedly are involved in the behind-the-scenes maneuvering—one, the social planners who fear the scrapping of housing, power, reclamation, and other programs to provide steel for military purposes; the other, the few conservatives still in the administration, who are not impressed by the arguments for either rearmament or social planning and would like to see things continue as they are, believing strong private industry the best preparation for a war that may not occur.

There are no indications that the President will change his mind with respect to military appropriations when he sends his budget message to Congress next month. The chances are good that Congress will pay more attention to the arguments of military leaders than to the budget, for two reasons: first, it has seldom pretended to be more expert than the experts on military needs and, second, it would have to take the blame if war found us unprepared because of refusal of funds.

On the other hand, if military requests are granted, they will cut more deeply into current production of steel and other materials, which would necessitate controls that would affect the oil and every other industry.

Military Waste

IF any wildcatter hunting for oil stubs his toe on 9,000 tanks, the Army will appreciate hearing about it for, believe it or not, it has "lost" that many out of the 25,000 tanks it estimated it had after the war.

The "missing" tanks, which cost some $2,250,000,000, is just one of the deficiencies chalked up against the military services by a task committee of the Hoover commission in a study of our national security organization.

The task group found a need for strengthening the authority of the secretary of defense over his own department, a top-to-bottom overhaul of military budget practices and procedures, a closer relation of scientific research and development to strategic planning, and expedition of plans for industrial and civilian mobilization in case of war.

Before the Hoover commission gets through, there are going to be a lot of red faces in Washington. It isn't pulling any punches, and in its report the task group expressed concern over the inadequate liaison between foreign policy and national military power, declaring flatly that "we have won two wars, only to lose the peace both times through lack of clear and consistent national policy objectives."

The military, it said, are planning how to fight the next war without knowing exactly what we would be fighting for.

The Hoover group also charged the military with waste, explaining it had failed to find a sense of cost-consciousness or a general realization of the vital importance to our national security of utmost conservation of our resources.

Despite the boasts of National Security Resources Board officials that they were blueprinting an over-all plan for industrial and civilian mobilization in the event of an emergency, the investigators found cause for grave concern in the present status of plans and programs for mobilization should war suddenly break upon us.

Throughout the report it was evident that the Hoover group was disturbed by the dominating part played by the military in running the defense department and the many boards and agencies directly or indirectly tied to it. Hence the recommendations for greater authority and control by civilian officials and a sharp reduction of military representatives on such groups as the National Security Council, which is charged with coordinating and establishing foreign and military policy. At present, there are three civilian and three military members on the council, but one of the civilians is the Secretary of Defense so that, in effect, the civilians could be outvoted on any matters affecting the armed forces.

Government Pay

IT begins to look as though the federal Government is finally going to pay its hired hands a living wage.

For a long time there has been a quiet strike against the Government—not of persons presently employed but of men the administration has tried to coax to Washington. Many jobs have been hard to fill because men of the type sought for them have scoffed at the $10,000-a-year ceiling on salaries in a city notoriously expensive to live in.

This reluctance to serve the Government does not extend to the presidency, for which it will be remembered there were several applicants as recently as November 2, but legislation which will be near the top of the congressional calendar next month will provide a raise for the President, possibly to $150,000 a year. Prior to last year's income-tax cut—which he vetoed—President Truman reportedly had all of $4,000 left after he paid the taxes on his $75,000 salary.

Under this mesaure, cabinet members may be boosted from their present $15,000 to $25,000 and the top for other officials may be as high as $22,500, with others getting $20,000 and $17,500, depending on the importance of their jobs.

Administration officials testifying at recent hearings before the Senate civil service committee warned bluntly that the Government couldn't be kept on a sound basis if its most important positions must be filled by men who have private means to supplement their salaries or by men without such resources who serve at too great a personal sacrifice.

Industry has long accepted the view that in hiring men, like buying shoes, better quality can be had by paying a little more, but the Government has been somewhat slow to recognize the increased cost of living. The $25,000 a year originally set as the President's salary was maintained until 1873, when it was raised to $50,000, but it was not until 1909 that the White House job began to pay $75,000, and it is more than a rumor that the dollar was worth more in those days.

Murray Elected Chairman of Texas Railroad Commission

HOUSTON.—William J. Murray, Jr., has been elected by his fellow commissioners to serve as chairman of the Texas Railroad Commission for the next 2 years, effective January 1.

W. J. MURRAY, JR.

Murray, a 33-year-old petroleum engineer, was elected this year to serve the unexpired term of Gov. Beauford H. Jester. He had been appointed to the commission in 1947 when Jester became governor. The new chairman's background includes serving the commission as an engineer, work with the Petroleum Administration for War, and petroleum engineering work in industry.

It is the custom of the commission to select for chairman the commissioner who is next up for election. Murray was nominated by Commissioner Olin Culberson and the nomination seconded by E. O. Thompson, present chairman.

Truman Includes Tidelands In State of Union Message

WASHINGTON.—Tidelands-oil legislation will be near the top of the program submitted to the new Congress by President Truman, it was made clear at the White House last week.

Discussing his plans at a press conference, the President said he will personally deliver his State of the Union message to a joint session of Senate and House on January 5, and would include his views on tidelands oil.

The President declared there has been no change in his position on this subject, definitely indicating that if Congress refuses to go along with him and, instead, passes a bill returning the California offshore lands to the state he will veto it.

Legislation returning the lands to the state was passed by Congress in 1946 and was vetoed by the President on the ground that Congress was not an appropriate forum to determine the legal issue then before the court. At that time, however, he pointed out the suit was instituted by the Department of Justice at his direction, and he has since indicated that he believes the oil lands off our coasts should be brought under the jurisdiction of the federal Government.

ECA Makes Large Grants For Oil and Equipment

WASHINGTON.—The Economic Cooperation Administration hit a new record high in its latest commitments for the procurement of oil by foreign nations, making grants of $46,897,000 to the Marshall plan countries, plus $22,000,000 to China for purchase of products in Saudi Arabia, and at the same time announced the first large grants for the procurement of American-made well-drilling and refining equipment—$1,344,700 to France.

The United Kingdom received more than half of the money committed to the Marshall-plan countries, getting two grants totaling $26,400,000 for the purchase during the current quarter of crude and products in the United States.

Other ECA grants provided Italy with $1,000,000 for crude and products from the United States and $6,702,000 for crude and products from Saudi Arabia during the first quarter of 1949; Sweden, $1,231,376 for products from the United States during the current quarter, and $290,000 for crude from Colombia, $116,000 for paraffin wax from the United States, $6,600 for paraffin wax from Canada, and $860,000 for crude and $2,846,600 for products from Venezuela in the second quarter of next year, and $921,900 for products from Saudi Arabia.

Denmark was granted $3,717,000 for purchase of crude and products during the current quarter from the Western Hemisphere, other than the United States, Canada, Newfoundland, Brazil and Argentina; Ireland $2,609,300 for products from the United States; and Belgium-Luxemburg, $197,000 for crude from Mexico.

1948 Gas Use Increase Should Continue Next Year, Says A.G.A.

IN reporting the accomplishments of the gas industry in 1948 and extending the figures to 1949 probabilities, Robert W. Hendee, president, American Gas Association said that despite continuing shortages of steel and other vital materials, more customers were served with gas than ever before, output of gas attained a new high level, gas utility revenues reached an all-time peak, and capital expenditures for construction and expansion of systems surpassed any previous figure in the history of the gas industry.

With gas-utility companies planning an expansion program calling for expenditures of $3.3 billion over the next 5 years, and with promotion, research, and advertising programs continuing at an accelerated rate, it can be conclusively predicted that the year ahead holds great promise to continue the unbroken record of advancement of the gas industry.

At the end of 1948 the gas utilities were serving 22,689,800 customers, including L.P.G. customers served directly by utilities, an increase of 4.1 per cent over 1947. Of this number 12,242,500 were receiving natural gas, a gain of 13.3 per cent; 8,369,000 were receiving manufactured gas, a decrease of 2.3 per cent, and 1,756,200 customers were served with mixed gas, a decline of 19.6 per cent. Approximately 320,000 customers received L.P.G. directly from utilities. Decreases in the manufactured and mixed-gas customer groups are attributed to changeovers of important companies to straight natural gas during the year.

Increase Seen in 1949

Based on normal rates of increase, gas utilities will be serving nearly 24,000,000 customers at the end of 1949, and with any improvement in steel shortages and any appreciable amount of additional natural gas in the manufactured gas areas, the 24,000,000 mark can easily be passed.

Utility sales of natural gas during 1948 were 2,802,079,200 M.c.f., an increase of 11.4 per cent over 1947. Manufactured gas sales amounted to 447,320,400 M.c.f., a gain of 3.0 per cent, and mixed-gas sales declined 15.1 per cent to total 146,173,400 M.c.f.

Total revenues increased 11.7 per cent during the year to reach an all-time peak of $1,559,624,600.

To meet the ever-growing demand for gas, utilities companies spent approximately $875,000,000 last year in the expansion of production, transmission, and distribution facilities, a figure which surpassed the previous record of $800,000,000 spent in 1947. The increase in 1948 is especially noteworthy when it is remembered that the 1947 figure included $143,000,000 for the purpose of the Big Inch and Little Inch pipe lines from the Government.

Forecasting a continuation of this tremendous demand for gas, the industry has estimated its capital requirements for construction and working capital for the 5-year period 1948-52 at 3.3 billion dollars, with more than 90 per cent of this amount to be expended for the construction of new facilities.

Natural Gas Growth Continues

The natural-gas branch of the industry continued its spectacular growth. The Federal Power Commission, during the year, authorized the construction of approximately 8,500 miles of new pipe line, bringing the total of natural-gas pipe lines in the the United States to about 251,330 miles. In addition to projects already approved, applications pending before FPC total an additional 14,600 miles.

Largest single authorization by the commission was for construction by the Trans-Continental Gas Pipe Line Corp. of an 1,840-mile pipe line from Texas to New York City at an estimated cost of $189,000,000. This new line, estimated to be the longest and costliest natural-gas pipe line in the world, will supply 340 million cubic feet of natural gas daily to gas-utility companies in New York, New Jersey, and Pennsylvania.

Other important authorizations include those for the Texas Eastern Transmission Corp. which will add 1,400 miles to its system, and the Tennessee Gas Transmission Co. which will add a 1,387-mile line from Texas to Pittsburgh. More than $675,000,000 was spent during 1948 on natural-gas expansion and it is estimated that about $1,950,000,000 will be spent in the next 4 years.

Shortage of steel, particularly in 24-in. to 30-in. steel pipe, are handicapping the expansion programs of natural-gas companies. Approximately 1,950,000 tons of steel were required for the 8,500 miles of pipe line authorized by the FPC in 1948 and an additional 3,675,000 tons will be needed to complete the additional 14,600 miles for which certificates are pending.

Proved natural-gas reserves continue to gain despite the increased yearly consumption and hold every promise of being adequate to meet the potential demand for many years to come. The reserves committee of the American Gas Association estimated that the proved recoverable reserves at the beginning of 1948 totaled 165.9 trillion cubic feet compared to 160.6 trillion cubic feet at the beginning of 1947, although 5.6 trillion cubic feet were produced during 1947.

The report also reviewed accomplishments in development of industrial and commercial markets for gas, development of new processes and equipment in manufacturing gas from low-cost fuels, and the work done in adopting natural gas to new appliances.

Steel Allocations Discussed By Steel and Oil Leaders

WASHINGTON. — Representatives of the oil industry met with a group of steel manufacturers this week for further discussion of the proposed voluntary allocation agreement to supply oil-field tubular goods and line pipe.

The meeting was the result of discussions at the session of the steel products advisory committee and officials of the Office of Industry Cooperation last month, at which it was agreed a new study of the line-pipe and tubular-goods programs would be made, as requested by Interior Secretary J. A. Krug.

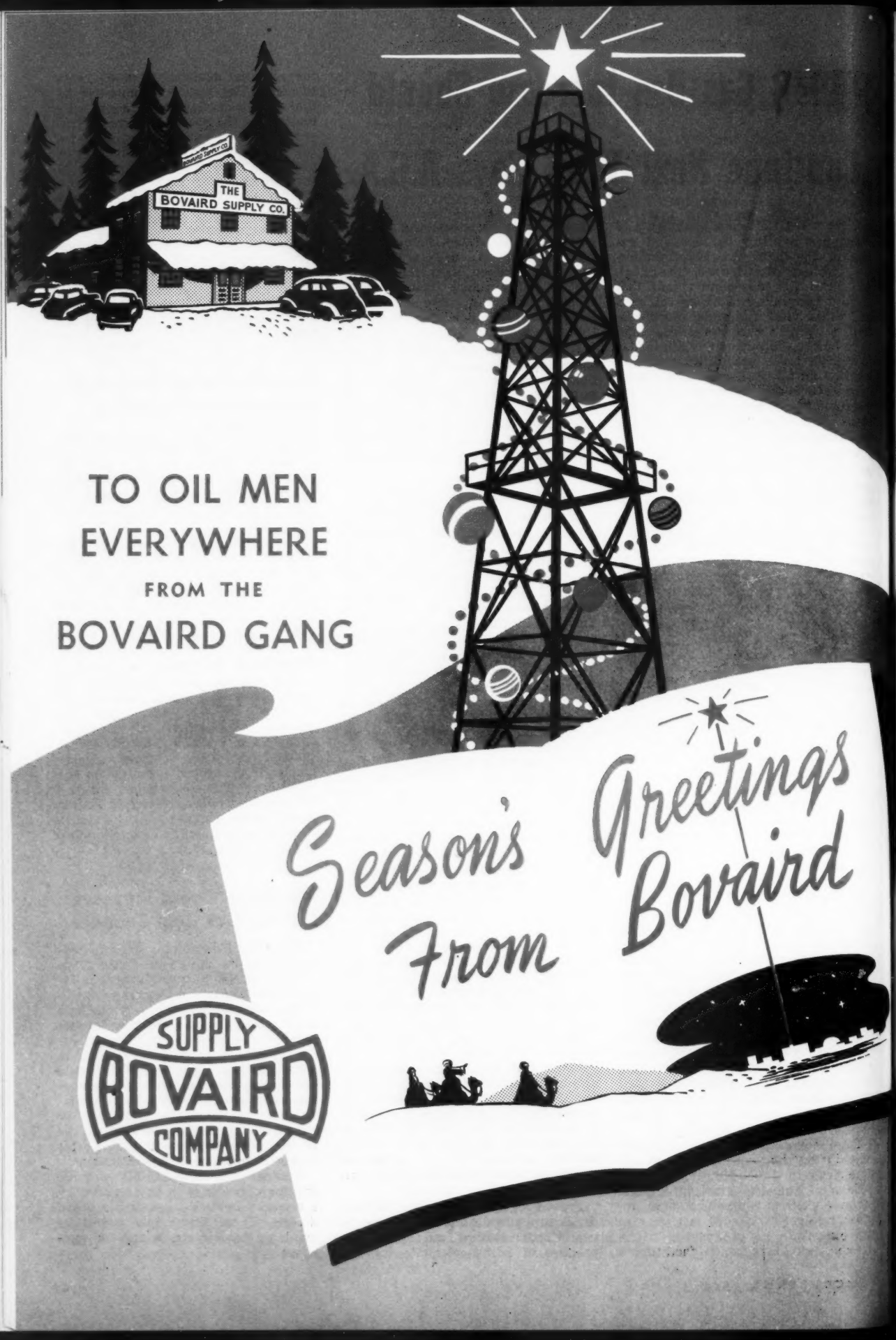
Representing the oil industry at the meeting this week were Russell B. Brown of the Independent Petroleum Association of America, chairman of the National Petroleum Council committee on steel requirements; D. A. Hulcy, president of the Lone Star Gas Co., Dallas; Edward Warren, Warren Petroleum Co., Tulsa; A. W. Peake, Standard Oil Co. (Ind.), Chicago; and John Suman, Standard Oil Co. (N.J.), New York.

Mississippi Board Proposes Oil and Gas Rule Changes

HOUSTON.—Changes and amendments in its statewide rules have been proposed by the Mississippi Oil and Gas Board.

The proposals set forth include holding hearings to establish allowables bimonthly for the two calendar months following the month in which the hearing is held. This would not apply to those fields where special rules provide otherwise. Allowable orders would be issued on or before the twenty-third day of the month preceding the 2 months for which orders are to be effective.

The new set-up would also provide for board hearings to be recorded by a reporter in such cases as the board directs. These transcripts would be available for inspection and for purchase.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PERSONALS

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Schwarz Named European Manager for Caltex

WILLIAM SCHWARZ, who has been connected with the refining organization of The Texas Co. and its associated companies for more than 20 years, has been appointed general manager, Europe, for California-Texas Oil Co., Ltd.

Schwarz takes over a new position in the Caltex organization and plans to leave late this month for Paris where he expects to maintain offices the next 2 or 3 years to supervise the European refinery construction program.

At present, Caltex is constructing a 20,000-bbl. daily refinery near Pernis in The Netherlands and is rebuilding a 13,000-bbl. daily former plant of The Texas Co. near Bordeaux, France. There have been unofficial reports Caltex is planning other European refineries, including one in Italy.

Caltex is a principal member of the Caltex-Bahrein group of companies which are owned equally by Standard Oil Co. of California and Texaco. Since December 1944, Schwarz has served as manager of the Ultramar S.A.P.A. refinery (Texaco and Socony-Vacuum Oil Co., Inc.) in Buenos Aires, Argentina.

A native of Baltimore, Schwarz joined The Texas Co. in July 1928 as a draftsman in New York following his graduation with a bachelor's degree in civil engineering at Johns Hopkins University.

Schwarz spent 14 years at Port Arthur, Tex., where The Texas Co.'s major domestic refinery is located. He successively advanced from foreman of the solvent and refining area, to supervisor, lubricating oil manufacture, to assistant superintendent, and to assistant to the general superintendent. For 2 years, he was engaged in terminal construction at Charleston, S. C., Mobile, Ala., and Jacksonville, Fla.

J. D. Wheeler, manager of Ohio Oil Co.'s Michigan district for the past 2½ years at Grand Rapids, Mich., has been named district manager for the company in West Texas and southeast New Mexico with offices in Midland, Tex. Wheeler will supervise all activities of the company in the Permian Basin. The district will continue as a part of the Houston division.

George D. Larson, formerly a seismograph interpreter in the Houston, Tex., office for Stanolind Oil & Gas Co., has been made assistant party chief of a group operating in South Texas. A second promotion within the company's Texas-Louisiana Gulf Coast division was that of **Lee A. McCrummen,** formerly farm boss in the Hastings district, Alvin, Tex., to production foreman in the district.

J. W. Sandberg, who has spent the past 6 years in Trinidad, B. W. I., at the refinery of Trinidad Leaseholds, Ltd., has joined the Perco division of the chemical products department of Phillips Petroleum Co. as process engineer. Sandberg is a graduate in chemical engineering from McGill University, Montreal, Canada, and is a former member of the Engineering Institute of Canada.

J. M. Payne, mechanical engineer, regional production department, Shell Oil Co., Inc., Houston, Tex., has been promoted to division mechanical engineer, Houston.

Dr. J. Brian Eby, Houston consulting geologist, has been elected president of the Texas Academy of Science which recently held its annual convention in San Antonio.

A. E. Groff, who has been serving as manager of the regional tax department, Shell Oil Co., Inc., Houston, Tex., will become secretary and a member of the executive staff of Shell Pipe Line Corp., Houston.

R. J. Andress, a director of Stanolind Pipe Line Co., has been named to succeed **J. L. Burke,** president of Stanolind Pipe, as chairman of the Shippers Oil Field Traffic Association. Burke has served as chairman of the organization since it was formed in 1941. Elected cochairman of the association was **T. M. Moore,** Atlantic Refining Co., Dallas.

K. W. HALEY

Kenneth W. Haley, formerly with Standard Oil Co. of California and Barnsdall Oil Co., has joined Deep Rock Oil Corp. as chief engineer in the production division. Haley graduated in petroleum engineering from Stanford University in 1926. He succeeds **C. O. Moss** who was named assistant to the vice president on special assignments. **Clyde E. Ragsdale,** assistant manager of the southwestern sales area for Deep Rock, has been appointed manager of the area to succeed **C. F. Coates,** who recently retired after more than 30 years' service. Ragsdale has been with the company since 1919.

Fred J. Shipley of the oil and gas division, Texas Railroad Commission, has been reelected president of the Houston Oil Men's Club. Other newly elected officers include: **V. V. Bright,** Gulf Oil Corp., vice president, and **V. D. Griffin,** Pan-American Pipe Line Co., secretary-treasurer. New directors are: **Joe Owens,** Sun Oil Co.; **George Miller,** Shell Pipe Line Corp.; **Sam Lucas,** The Texas Co.; **John Roberts,** Humble Oil & Refining Co.; **R. R. Dean,** Hutex Oil & Refining Co.; **T. B. Hickman,** Gulf Oil Corp.; and **W. L. Seibert,** Pure Oil Co.

Robert M. Hutchison, director of research and safety, Houston Natural Gas Co., has been elected first vice president of the San Jacinto chapter of the Texas Society of Professional Engineers. **Mercer H. Parks,** petroleum engineer, Humble Oil & Refining Co., has been chosen as a director of the same group.

Alfonso Barnetche, formerly assistant manager of production for Petroleos Mexicanos, has been appointed general manager of production to succeed **Bernardo Fernandez Grajales,** who has been promoted to manager of the department of new projects. **Francisco Iguanzo** has been named to succeed Barnetche as assistant mana-

PERSONALS

ger of production for Pemex. Barnetche in 1935 was awarded a degree in petroleum engineering from the National University in Mexico City, the first such award by that university. Prior to joining Pemex in 1938 he had served with Independent Exploration Co. in Texas and Louisiana, with Sinclair Oil Co. in Poza Rica, and for Mexican Oil Co.

G. R. YOHE

Dr. G. Robert Yohe, head of the coal division of the Illinois State Geological Survey, Urbana, Ill., has been elected chairman of the division of gas and fuel chemistry of the American Chemical Society, succeeding **Dr. Calvert C. Wright,** chief of the division of fuel technology of the Pennsylvania State College School of Mineral Industries. Dr. Yohe has been with the geological survey since 1937. **Dr. Ralph E. Brewer,** chemical engineer with the central experiment station of the United States Bureau of Mines, Pittsburgh, Pa., was chosen chairman-elect.

C. N. Pfohl, Jr., head of the crude-oil production department for Kendall Refining Co., has been appointed a member of the production research advisory committee of the Pennsylvania Grade Crude Oil Association. **G. W. Holbrook,** Bradley Producing Corp., Wellsville, N. Y., in chairman of the committee.

Nelson Jones, a member of Humble Oil & Refining Co.'s law department since 1937, has been appointed general attorney for Humble. He has resigned as vice president and member of the board of directors of Humble Pipe Line Co. to accept the new position and succeeds **R. E. Seagler** who has had more than 23 years service with the company. Seager will open a private law practice in Houston immediately.

Jack M. Clover, land man and general field superintendent for Wilcox Oil Co., will resign to become an independent to handle oil and gas leases and royalties. He has been associated with Wilcox for the past 23 years.

Jim Huitt, a graduate of Louisiana Polytechnic Institute and who last year took up graduate work for a Ph.D. degree in chemical engineering, has been awarded the Magnolia fellowship, which was recently established in the school of engineering at the University of Oklahoma.

Dr. W. W. Hagan, formerly with Sohio Petroleum Co., recently joined Felmont Oil Corp. at Owensboro, Ky., as chief geologist.

O. H. Carlisle and **H. S. Gwyn,** division sales manager and assistant division sales manager respectively for Gulf Oil Corp., have retired after 51 years in the oil industry and 44 of them spent in close association with each other. **Madison Farnsworth,** assistant division manager for the past 15 years, has been named the new division sales manager to succeed Carlisle.

G. F. Duncan, district superintendent for Continental Oil Co. at Borger, Tex., has been named superintendent for the company's West Texas district production department at Big Spring. He succeeds **Garnett Plank,** who recently resigned and is now located in Ardmore, Okla. Other promotions of Continental personnel in the Permian basin include: **N. A. Rickman,** formerly assistant district superintendent at Big Springs, to district superintendent at Borger: **O. C. Chapman,** formerly district foreman at Denver City, succeeds Rickman; **W. E. Allen,** formerly farm boss at Eunice, N. M., succeeds Chapman; **P. A. Cooper,** formerly head roustabout for Ector County, at North Cowden, succeeds Allen as farm boss at Eunice; and **O. F. Griffith** becomes head roustabout for Ector County.

David M. Liles, plant foreman at the Gilliam gasoline plant in Vivian, La., for Stanolind Oil & Gas Co., has been named plant foreman of the company's new natural-gasoline plant at Stano, Kans. He is succeeded by **Gilbert R. Wallace,** formerly operator at the company's Hastings plant, Alvin, Tex. Other recent changes in Stanolind's personnel include: **John V. Morgan,** engineer at the Central Kansas district office at Ellinwood, has been named field engineer for Stanolind at Zenith, Kans.; and **Alton C. Christenson,** formerly with a company core-drill party in Florida, has joined Stanolind's exploration office at Shreveport, La., as a geologist.

Dr. Wayne E. White, Ozark-Mahoning Co., Tulsa, has been elected chairman of the Tulsa section of the American Chemical Society. He succeeds **Dr. Paul H. Cardwell,** chief chemist of Dowell Incorporated, who was named section representative on the society's national council. **J. L. Burkitt,** Mid-Continent Petroleum Corp., was named vice chairman and **Dr. Alfred Steitz, Jr.,** of the process division of Stanolind Oil & Gas Co., secretary. **Dr. David D. Hartley,** Mid-Continent Petroleum Corp., was reelected treasurer, and **R. W. Provine,** assistant chief chemist of Mid-Continent, was named alternate councilor.

Paul M. Buttermore, geologist for Danciger Oil & Refining Co. at Fort Worth, Tex., will join the Bureau of Mines at Washington to serve on the petroleum economics branch staff.

Tom Fox, scout for Atlantic Refining Co., in Jackson, Miss., will join the land department in Midland, Tex., near the end of the year.

C. C. Michel has been made production superintendent in West Texas for **Edward C. Lawson,** independent operator, with headquarters in Midland, Tex.

Carl Wender, supervisor of state land leases with the Michigan Department of Conservation, has resigned to join the land and title department of Sun Oil Co. at Mt. Pleasant, Mich.

W. C. MacMillan, vice president in charge of production for Continental Oil Co., has been appointed to the newly created position of vice president and administrative assistant to the president, effective January 1. MacMillan, who joined Continental 20 years ago as an instrument man in the geological department and transferred to the land department in 1930, became manager of the land department in 1938. He was elected vice president in charge of production in 1943.

Other important changes in the company's production and exploration departments include: **E. W. Webb,** formerly assistant manager of production, to manager of the production department, with headquarters in Ponca City, Okla.; **M. H. Shanahan,** formerly assistant manager of the production department, to the newly created position of senior consultant to the department; **Glenn C. Clark,** formerly chief geologist, to the newly created position of senior staff geologist; **J. A. Culbertson,** formerly assistant manager of the geophysical department, to chief geologist, succeeding Clark; **S. K. Clark,** formerly chairman of the exploration committee, to the newly created position of coordinator of exploration activities; **O. L. Fisher,** formerly regional production manager, Houston, to assistant manager of the production department, Ponca City; **J. P. Malott,** formerly assistant regional production manager, Houston, to regional manager of production, Houston, succeeding Fisher; and **H. F. Nabors,** formerly district production superintendant, Thermopolis, Wyo., to assistant regional manager of production, Houston, succeeding Malott.

Irving N. Simmons, who has been in the patent division of Houdry Process Corp. since 1934 and associated with the company since the firm was founded in 1931, has been named head of the patent division for Houdry. Simmons' early engineering work was in connection with the design and operation of Houdry pilot and semicommercial units.

Orlo W. Bond, manager of the New Delhi branch of the India division of Standard-Vacuum Oil Co., will retire January 1 after 26 years with the company. Bond is now on company furlough at Rockport, Mass., pending his retirement.

H. H. Kuester, Standard Oil Co. of Texas, is the new president of the Houston Landmen's Association succeeding **J. Erick Beall,** Gulf Oil Corp. Other new officers are: **J. E. Suttles,** Union Oil Co. of California, vice president; **Haymond Willis,** Pan American Production Co., secretary; and **C. C. Steinberger, Jr.,** Midstates Oil Corp., treasurer.

H. Wilkinson, president of Shell Caribbean Petroleum Co., Inc., has been elected a director of Shell Transport & Trading Co., Ltd., the British holding company for the Royal Dutch-Shell group. Wilkinson also is president and a director of Asiatic Petroleum Corp. and a director of Shell Union Oil Corp.

Commissioner Claude L. Draper of Wyoming, a member of the Federal Power Commission since 1930, has been elected vice chairman of the FPC to serve during the calendar year 1949. He succeeds Harrington Wimberly of Oklahoma.

Richard Wagner, president of The Chicago Corp., and six members of the board of directors were in South Texas on an inspection tour of the firm's oil and gas properties in the area. In the group, besides Wagner, were: **Hugo A. Anderson,** vice president, First National Bank, Chicago; **Ralph E. Bard,** Chicago financier who formerly was undersecretary of the navy; **Arthur D. Chilgren,** chief counsel for The Chicago Corp.; **Charles F. Glore,** chairman of the board of directors, The Chicago Corp.; **Howard J. Klossmer,** vice president, The Chicago Corp.; and **Martin Lindsay,** chairman of the board, Middle West Corp.

M. T. Smith, Shell Oil Co., Inc., has been named president of the Permian Basin Crude Oil Scouts Association for 1949. He succeeds **W. E. Bates,** The Texas Co. Other officers named include: **R. L. McCormick,** Magnolia Petroleum Co., vice president; **Jack Coates,** Cities Service Oil Co., secretary-editor; **Lawrence B. Berry,** Shell Oil Co., Inc., treasurer; and **R. L. Denton,** Magnolia, director in the National Oil Scouts and Landmen's Association. All officers are from Midland, Tex.

SHIFTS—

Herbert G. Rim, geologist, Geophysical Service, Inc., Santa Barbara, Calif., to Houma, La.; **E. M. Benson,** engineer, Richfield Oil Corp., Sunset Beach to Taft, Calif.; **Evan Watts,** foreman, Magnolia Petroleum Co., Balton to Lampasas, Tex.; **E. C. McIntyre,** superintendent, Sinclair Prairie Oil Co., Breckenridge to Olney, Tex.; **F. Darden, Jr.,** engineer, Humble Oil & Refining Co., Corpus Christi to Encino, Tex.

W. H. Holleran, superintendent, Shell Oil Co., Inc., Orange, Tex., to Franklin, La.; **H. C. Talley,** engineer, The Texas Co., Littlefield to Brownfield, Tex.; **Thomas C. Frick,** superintendent, Atlantic Refining Co., Odessa to Midland, Tex.; **William R. Cox,** engineer, Sun Oil Co., Odessa to Monahans, Tex.; **R. S. Parratt,** geologist, Arkansas Natural Gas Co., Shreveport to Vienna, La.

Elbert M. Deforest, engineer, Spencer Chemical Co., Liberal, Mo., to Tulsa; **Charles R. Durand,** engineer, Esso Standard Oil Co., Brooklyn, N. Y., to Rahway, N. J.; **Carl A. Lesh,** superintendent, D. B. Lesh Drilling Co., Mattoon to Centralia, Ill.; **Charles E. Stout,** superintendent, National Gas & Oil Corp., Parkersburg, W. Va., to Newark, Ohio; **William Beer,** geologist, Carter Oil Co., Rifle to Craig, Colo.

William G. Cutler, engineer, The California Co., Rangely to Hamilton, Colo.; **Jack R. Fraser,** engineer, Shell Oil Co., Inc., Great Bend, Kans., to Healdton, Okla.; **Richard A. Aukerman,** engineer, Shell Oil Co., Inc., Great Bend to McPherson, Kans.; **J. C. Morrison,** superintendent, Midwestern Drillers, Ulysses to Liberal, Kans.

Robert B. Austin, geologist, The California Co., Escalante, Utah, to New Orleans; **J. T. Gilliam,** foreman, Amerada Petroleum Co., Cody, Wyo., to Carlsbad, N. M.; **W. K. Rickel,** engineer, Amerada Petroleum Corp., Watford City, N. D., to Glasgow, Mont.; **Jack Martin,** geologist, General Geophysical Co., Kemmer to Douglas, Wyo.; **Gordon G. Lancaster,** engineer, Sun Oil Co., Odessa to Dallas, Tex.

DEATHS

John A. Wolfe, 74, who retired as northern district production chief for Sinclair Prairie Oil Co. 2 years ago, died December 15 in Tulsa. Early in his career Wolfe was sent to North Borneo where he spent 4 years supervising drilling operations for Standard Oil Co. (N.J.).

Curtis R. Smith, 49, drilling superintendent for Williams-Copeland, Inc., Tulsa, died December 17 in Blackwell, Okla. Prior to joining Williams-Copeland, Smith had been drilling superintendent for Helmerich & Payne, Inc., in Kansas.

Prof. T. G. Madgwick, internationally known geologist, died December 14 in Ottawa, Ont. Madgwick was well known for his work in Bahrein for Eastern & General Syndicate, Ltd., of London, which secured the oil concession over that area.

Claude C. Clothier, 73, well-known Oklahoma oil man who 3 years ago retired from Shell Pipe Line Co., died December 16 in Houston, Tex.

Joseph A. Tennant, 60, consulting petroleum engineer of Houston, died December 14 in Houston. Tennant engineered the huge cycling plant in Old Ocean field, Brazoria County, Texas.

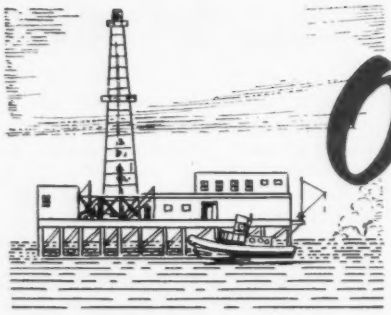
Alexander Buchan, 55, chief engineer of Shell Oil Co. of Colombia, and **Eric Howie,** 43, of the engineering department of the company, were among the 30 persons killed December 15 in an airplane crash near Barranquilla, Colombia. The two engineers were British subjects.

Frank Murdoch Racher, drilling contractor of Petrolia, Ont., died recently in Petrolia. He had recently completed a drilling contract in Peru.

John J. Hayes, 53, chief accountant of the International Cooperative Petroleum Association in charge of the organization's tanker shipments, died December 15 at his home in New Rochelle, N. Y.

Robert E. Daley, 62, superintendent, general mechanical department, Humble Pipe Line Co., Houston, died December 15 in Houston.

Virgil G. Gillingham, 62, accountant and federal tax head of The Texas Co., Houston, Tex., died December 18 in Houston.



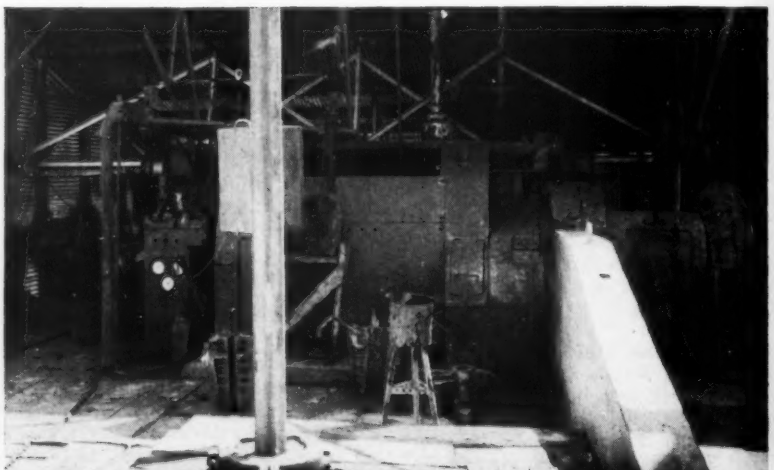
Offshore Drilling

INVOLVES ENORMOUS EXPENDITURES

This is a different kind of story about the widely publicized "Gulf of Mexico - Continental Shelf" oil-exploration campaign. Most everybody knows that these new-type operations are very expensive — but just what are the figures? Here the Gulf Coast editor and the Journal's staff photographer team up to give a word-and-picture account, item by item and dollar by dollar, of a typical marine-drilling program.

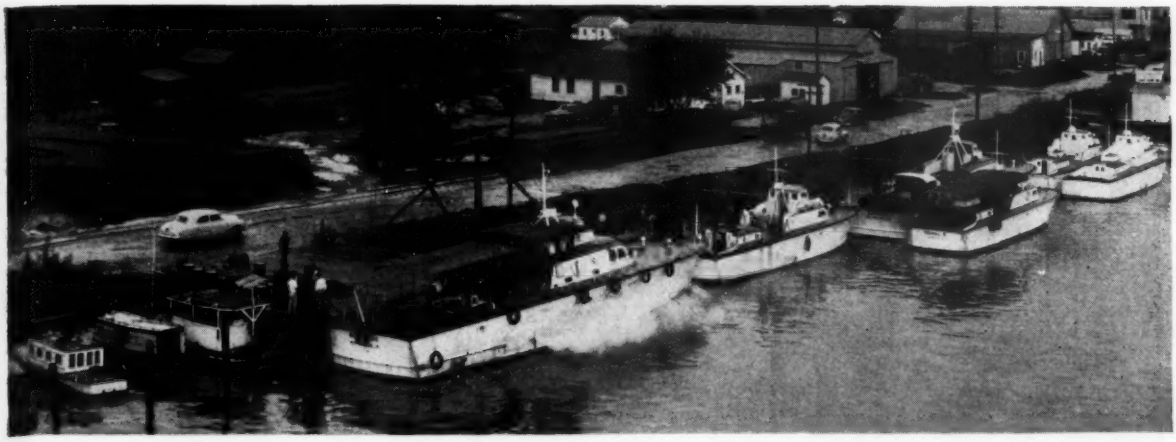
PLATFORM

by Leigh S. McCaslin, Jr.



↑ DRILLING EQUIPMENT

↓ BARGE



DRILLING for oil in the Gulf of Mexico is an expensive undertaking. Oil companies, in the short span of 40 months, have invested an estimated $75,000,000 in the search for production in this newest of American oil frontiers. Shown pictorially on these pages are the equipment and manpower requirements for the drilling of one well in the open, unprotected waters of the Gulf. These pictures cover the operations of Kerr-McGee Oil Industries, Inc., of Oklahoma City. Kerr-McGee was the operator for the first well in the world to discover oil out of sight of land. . . . the Kerr-McGee, Stanolind Oil & Gas Co., and Phillips Petroleum Co. 1 Block 32 which was brought in November 1947, 10 miles offshore from Terrebonne Parish, Louisiana.

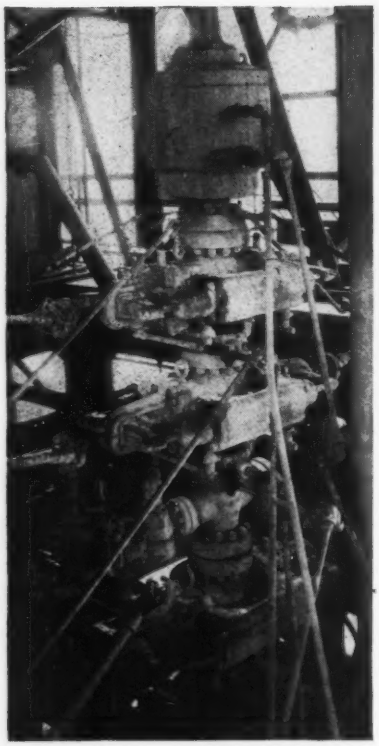
Kerr-McGee was the developer of the barge-platform method of drilling wells in unprotected waters. In this system, a floating barge is teamed up with a permanent piling platform. The platform contains the derrick, draw works, and an auxiliary mud tank, while the barge contains living quarters, mud pumps, fuel, water, pipe, and all the various items necessary to drill a well.

LABOR

FLEET

COMMUNICATIONS ↑

HOUSEKEEPING ↓



BLOWOUT PREVENTION

LEASE

$150,000 . . . was paid the State of Louisiana as bonus for the 20,000-acre block of leases on which the drilling well is located.

In addition, Kerr-McGee agreed to pay an annual rental on each 5,000-acre tract within the block equal to half the amount of the bonus until such time as drilling operations were commenced on each such tract or the 5-year lease expired. Drilling of the well on Block 32 halted rental payment on the 5,000-acre tract on which the well is located. However, the delay rentals on the other three tracts were paid in September 1947 and September 1948 amounting to $62,500 annually. Although the total considerations are high, the per-acre cost is in line with dry-land leasing costs.

EXPLORATION

$34,000 . . . is required monthly to keep a seismograph crew at sea. In the Gulf Coast area, seismograph work is thus over twice as costly on water as on land.

BARGE

$230,000 . . . represents the amount necessary to purchase and convert this war-surplus, 260 ft. long by 48 ft. wide, Navy YF steel barge. This craft was purchased for $75,000 from the Maritime Commission and converted to the required specifications for offshore work, at a cost of $155,000, not including drilling equipment. The barge contains all the supplies and auxiliary equipment necessary for the drilling of a 15,000-ft. well in addition to drilling-crew quarters, galley, hospital, recreation room, and communication facilities.

PLATFORM

$240,000 . . . was necessary to construct this 38 by 71-ft. platform. The platform proper is 20 ft. above mean low tide and the rig floor is an additional 13 ft. above the platform. In construction, 24-in. o.d. pipe piles were sunk a maximum of 104 ft. into the ocean bed. The pilings were braced with 9⅝-in. steel pipe above the water level.

DRILLING EQUIPMENT

$335,000 . . . is invested in the derrick and normal dry-land drilling equipment. The platform contains a conventional National 100 rig, a 141-ft. specially designed derrick to withstand wind loads of 125 m.p.h., draw works, drilling engines, small water and fuel tanks, mud tank, and a mud pump. Drilling equipment contained in the YF barge includes two diesel-powered mud pumps, electric-generator, and reserve and operating mud pits.

FLEET

$426,000 . . . was required to purchase—war surplus—the 13 auxiliary craft used in Kerr-McGee's operations. This figure does not include conversion costs, and, in addition, represents only a fraction of the sum which would be necessary to buy these boats new. For example, the 85-ft. air-sea rescue boats, which originally cost the Government $185,000, were bought as war surplus for $25,000—roughly one-seventh of their original cost. In addition to the company-owned fleet some craft are leased. For instance, it is necessary to keep a tug standing by the drilling location at all times during the hurricane season from the middle of July through September. Expense of such a tug runs from $400-$600 per day.

LABOR

$429.50 . . . is spent daily on one rig for labor costs. The men in the picture represent the personnel normally on the well location at one time. Two 12-hour shifts are employed. Personnel include: two drillers, two derrickmen, eight crew members, a toolpusher, one "A" cook, one "B" cook, two helpers, a mechanic, a welder, and a drilling superintendent. In addition, at various times during the drilling operations, personnel such as geologists, and Halliburton and Schlumberger employes will be on the platform. Inset is Tom Seale, chief engineer for Kermac, who is in charge of the company's offshore operations. Sea drilling requires a number of supervisory personnel with skills not associated with dry-land digging—such men as communications experts, stewards, and marine superintendents.

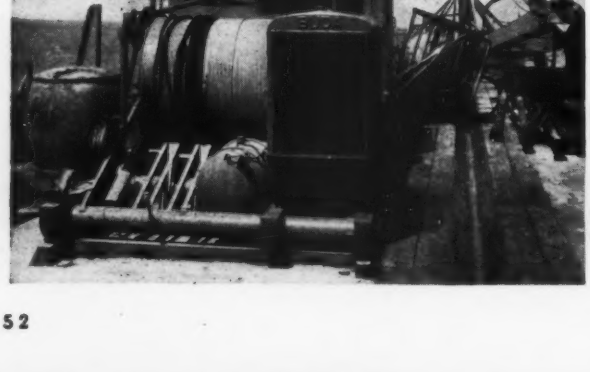
COMMUNICATIONS

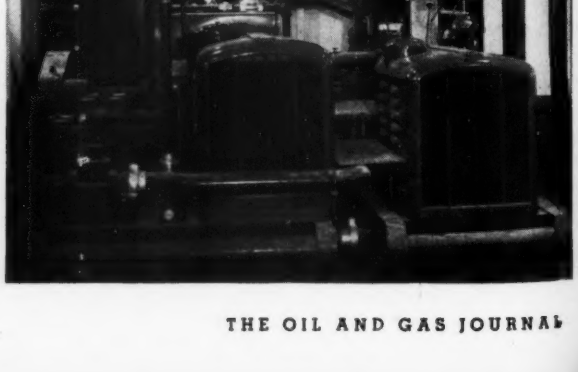
$16,100 . . . was spent to purchase the two-way radio and radio-telephone equipment which links the boats, drilling location, and land headquarters. This figure includes 12 two-way radio installations and 2 radio-telephone installations. A single radio for the boats costs $750 while the hub station in land headquarters represents an investment of $1,000. A full-time communications superintendent is employed to supervise the operation of this important phase of offshore drilling.

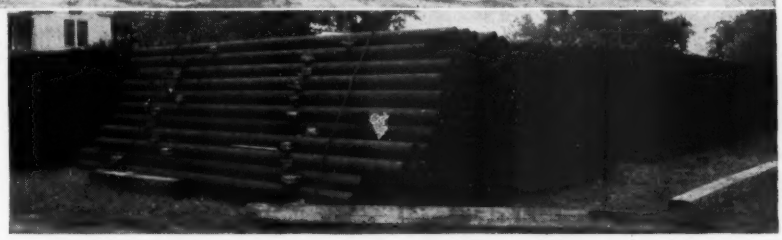
BLOWOUT PREVENTION

$30,000 . . . is pictured here in the form of blowout-prevention equipment. Special precautions are taken

SERVICE UNITS







PRODUCTION

in the drilling of offshore wells because of the obvious hazards of a blowout at sea. On this particular well there are three pressure-operated blowout preventers, and one pressure operated master gate.

SERVICE UNITS

Several thousand dollars monthly rental is paid for these cementing and electrical well-logging units. Unlike land operations, these service units remain on location at all times. Both pieces of equipment have been especially designed to withstand the rigors of weather at sea.

WEATHER

$720 . . . was required to repair the damage sustained by this 85-ft. air-sea rescue boat while trying to transfer supplies to the drilling platform during heavy seas. Unexpected difficulties, such as this, are common to offshore operations. Drilling is a 24-hour-a-day proposition and it is necessary to keep all phases of the operation active except in the event of extremely bad weather such as hurricanes. Constant radio monitoring is done at land headquarters to provide a constant check on weather conditions. Storm paths are plotted and warnings provide the offshore locations.

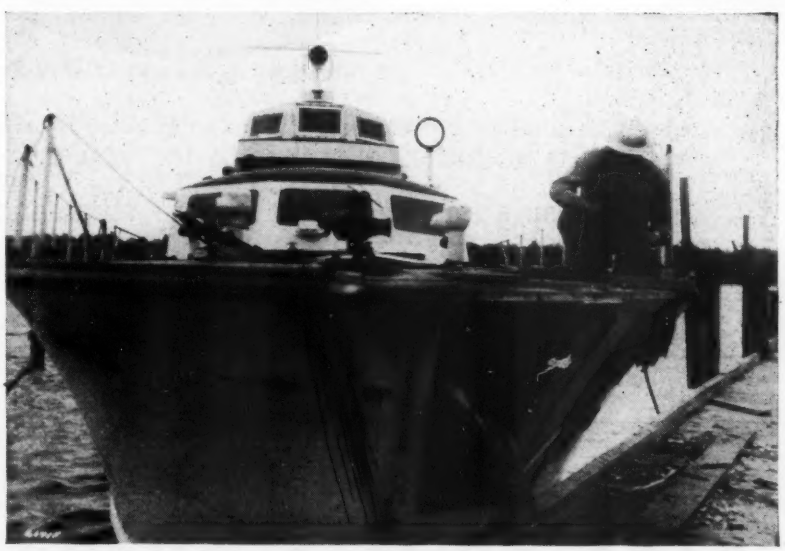
HOUSEKEEPING

$700 . . . is spent weekly for groceries on the offshore location. A typical week's grocery list reads: 2 cases of eggs, 224 loaves of bread, 135 steaks, 50 lb. roast pork, 25 lb. ground meat, 36 lb. bacon, 1 shoulder of salt meat, 2 hams, 1 case fryers, 1 case hens, 2 sacks potatoes, 1 sack onions, 6 doz. oranges, 6 doz. apples, 15 doz. bananas, 1 case lemons, 20 lb. butter, 672 qt. milk, and a $250 wholesale grocer order which includes canned goods, soap, etc. Housekeeping expenses don't stop with groceries. The steward also provides 72 sheets and 32 pillowcases for one change (every other day), 96 towels every other day, 28 T-shirts twice a week, and 60 hand towels every other day. To keep the floors shining requires 5 gal. of wax per week. For the summer season, the rig requires 25 gal. of fly spray.

PRODUCTION

85c . . . per barrel is the present cost of producing and transporting a bbl. of oil to inland storage. This figure is approximately six or seven times that of a similar well on land. Company officials state that this figure "would probably be somewhat higher" if it were not for the fact that it is possible to use much of the drilling operation equipment in the producing operations. For example, the radio network and auxiliary craft are being charged against the drilling operation. When the day comes that the drilling operations are complete, the cost figure may change. On the other hand, oil is presently being produced by the relatively expensive method of barging. (See picture.) If sufficient oil reserves are discovered, it may become feasible to lay a pipe line to shore or conceive some other more economical method of producing the wells. The 17.95 (94,776 ft.) miles of 6⅝-in., 25-lb. pipe in the picture has been purchased for such a contingency.

WEATHER



An abundance of health for you and yours in the year about to unfold . . . the stimulation of diligent effort and the reward of high achievement . . . the love of your family, the respect of your associates and the esteem of your friends—these are the riches we wish for you during the holiday season, the wealth we hope you will enjoy through 1949.

GASO PUMP & BURNER MFG. CO.

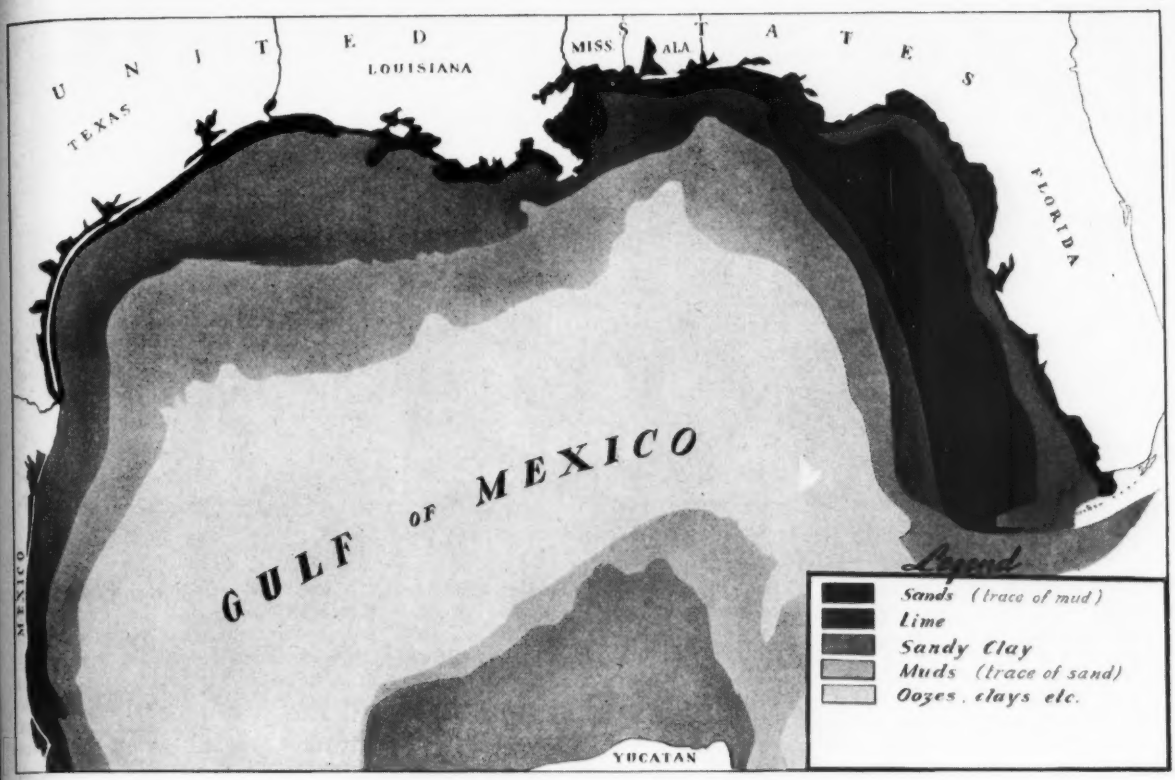


Fig. 1—Map showing deposition of sediments in Gulf of Mexico

Where Should You Look for FUTURE OIL FIELDS?

This article is intended for the average oil operator. It gives a fairly simple explanation of some of the latest ideas about how to improve our oil-field finding. These are the ideas that look good to a group of the industry's most prominent research geologists.

by Charles J. Deegan

THE question of where to look for future oil fields has many answers from the exploration scientists. But all the answers include two requirements. You should look for favorable oil traps in sedimentary basins. How do you do this? Well, first of all, finding sedimentary basins is not difficult. The geologists have already roughly outlined most of them in North America. They have made a pretty good start in South America, but with considerable work still to be done. In the Eastern Hemisphere, considering the number of wells drilled, most of the major basins are reasonably well known.

What about the other requirements—finding a favorable oil trap When it comes to finding traps, the geologists and geophysicists as a team have made much progress. They will probably keep on improving because they are never satisfied with their methods and are always hunting a still better one. But the prescription for finding an oil field called for a "favorable oil trap," not just a "trap." And that is where the trouble lies.

Exploration men say that the weakest spot in oil-exploration science is that we don't know exactly what conditions are required for a favorable oil trap. Why do you get dry holes on some structures, while others produce oil? The dry structures look just about the same as the producers, at least as far as one can see now. Why do some sands produce on one structure and not on another structure in the same neighborhood? This can happen, even when both structures produce oil from other pays. Why do oil traps often line up in trends? Why do these trends start and end where they do? Why will a sand pinchout give you an enormous strat-trap field like East Texas in one place, and only dry holes in another? You can't get definite answers to these questions—today. What are the prospects of your getting the answers in the future?

The geologists have been working hard on these problems for several years now. They haven't solved them, but by now they are pretty well

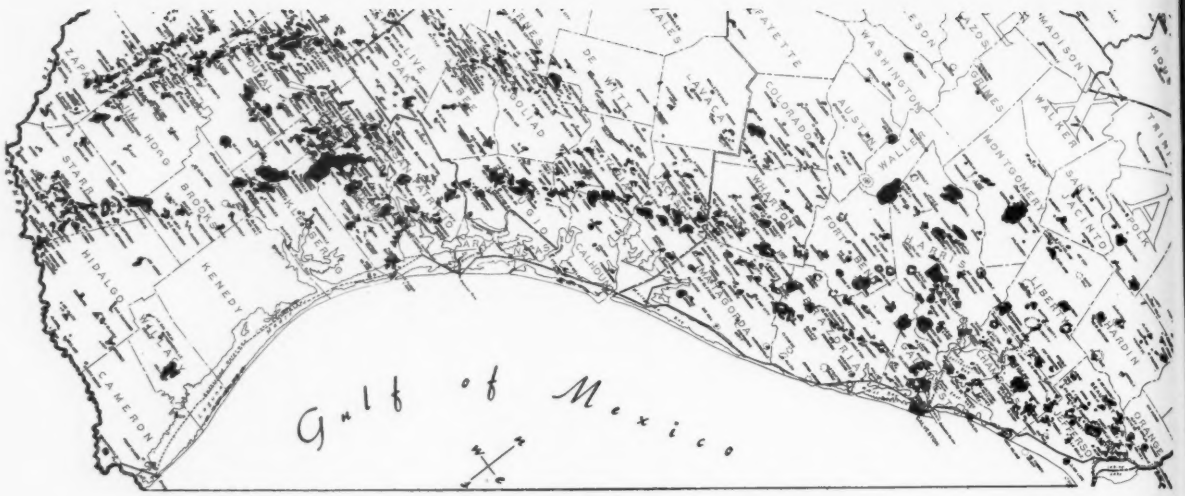


Fig. 2—Map showing belt trends in oil fields along Gulf

agreed on the lines of attack that are most likely to get the answers.

"The big problems deal with the relationships between sediments and oil accumulation. You need a new specialist, a sedimentologist, to study sediments and use imagination plus horse sense to find relationships in scraps of evidence."

The New Specialist's Job

The job of this new specialist is to examine all the conditions that existed when any particular sediments were deposited in the water. From the results, he will try to figure out what conditions were different at "A" (where you found a big oil field) from those at "B" (where you got a dry hole in the same formation).

If he succeeds in finding which conditions were different, he is ready for the next step. The next step is to try to find out what natural laws or factors caused these critical conditions to change. If he finds these answers, he has something really important. He can then probably figure out signs in other places that will show when and where dry-hole conditions are changing toward those favorable for oil.

Development of this specialty won't mean the end of dry holes. But it should improve your sharpshooting considerably in wildcatting. It should mean that many a future dry hole will point out the direction to a place where you can find a new oil field. It might even indicate about how far away oil ought to be present. Other dry holes might show you that conditions were not good for oil anywhere in that area. This might save drilling a lot of wildcats in "teaser" areas, where you get many shows but no oil wells.

Before this kind of sharpshooting can be developed and applied to your company's exploration work, considerable research work is going to be necessary. A great deal of the basic part of this research is well suited to group or cooperative effort. This has been recognized by the research committees of both the American Association of Petroleum Geologists and the American Petroleum Institute. After several years of extensive work, the A.A.P.G. presented a proposal for broad-scale fundamental research into sedimentology. This proposal was approved by the A.P.I. Now this proposal is in the stage of laying out definite problems, and finding the men and the places where the work can be done.

Much of this work will probably be started in the Gulf of Mexico area. The reasons for this are interesting. You must observe what goes on today when sediments are being laid down under water, if you want to understand what happened in the past. You start your work on the simplest problems, where you have the least trouble figuring out what are basic principles, and what are unimportant details. The basic principles found here should also apply to more complex problems. So, you learn to crawl, to walk, and then to run, before you try the high hurdles.

It happens that the Gulf of Mexico basin is one of the simplest of all known geological basins. It also has the facilities and conditions favorable for research work: harbors, towns, transportation, communications, etc. The fact that a rich oil province lies around the edge of the basin is important, but its comparative geological simplicity is the main factor.

Sediments are being laid down today in the gulf under general conditions that have remained about the same since the beginning of Tertiary time at least. Most of the oil fields found on the Gulf Coast so far, are in the Tertiary. The most likely future prospects are also expected to be in the Tertiary.

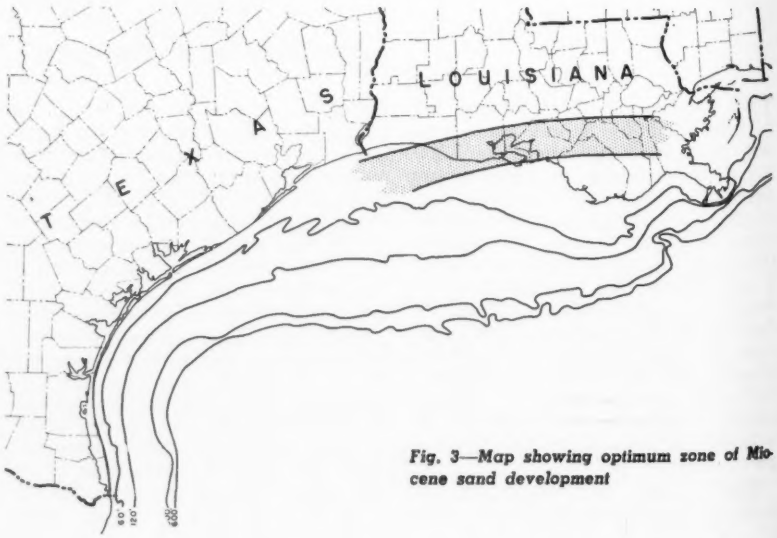
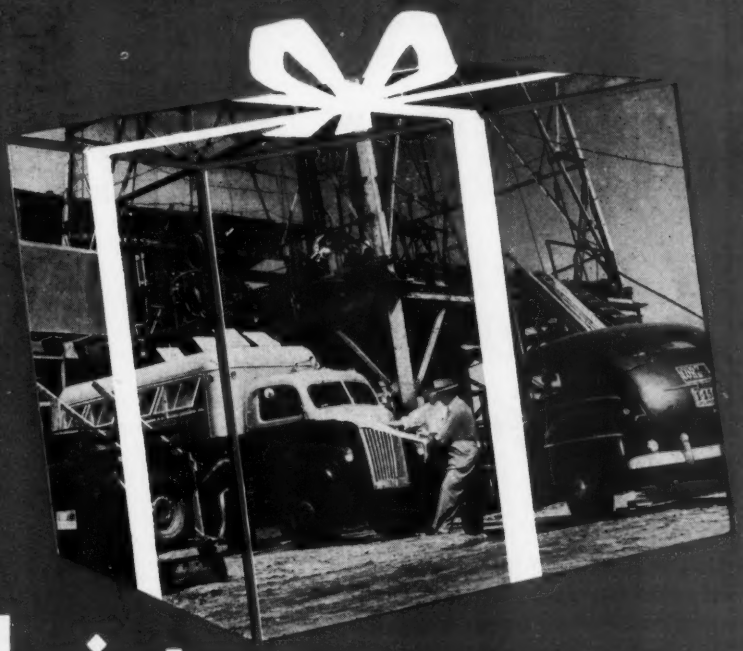


Fig. 3—Map showing optimum zone of Miocene sand development



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On the north and west sides of the gulf embayment, many good-sized rivers have been eroding a big chunk of a continent for millions of years and dumping the material into the gulf (e.g., the Rio Grande and the Mississippi). On the south and east sides of the gulf, the drainage area is small and local, e.g., the Florida Peninsula. Therefore, on the north and west you find vast thicknesses of shales and sandstones (up to 40,000 ft. in Tertiary time alone) deposited in the embayment. On the south and east sides, you find the Tertiary deposits are largely limestone. You would expect these deposits to be thinner because material from a smaller area drained in here. This idea checks out. The maximum thickness of Tertiary limes is only about 5,000 to 6,000 ft., found in the Florida Peninsula. This compares with 40,000 ft. of Tertiary sands and shales farther west and north.

The distribution of these sediments back through Tertiary time shows that the form of the basin and the source of the sediments were about the same then as they are now. Studies of the salinity and temperature of the gulf water show that these properties are also about the same today as they have been for a long period of geological time. Studies of foraminifera fossils and the organisms which produce them, show that the general biological environment is likewise probably about the same today as it was throughout much of the late Tertiary period. All of this evidence adds up to tell you that the things happening in the gulf today are pretty much the same as those that were happening millions of years ago.

What about the particular conditions that resulted in the accumulation of oil? After all that is what you want to find. Are there any trends that look like they might mean something? Here, too, you find that the general conditions are fairly simple. Oil fields fall into a series of belt-line trends on the land around the gulf. These belts are roughly parallel with the shore line. You can see these belts by just looking at a regional map that shows the oil fields. You don't have to be a geologist to spot them.

Even geologically, however, the main principle of these trends is fairly simple. Starting farthest inshore there is a belt of Tertiary pools that produce from the Wilcox (no kin to the Oklahoma Wilcox sand); then next toward the coast line comes a belt of Yegua production; next a belt of Frio pools, and finally where the present shore line extends out farthest into the gulf, Miocene. These are the major trends, although there are many minor ones. In the geological time column, the Wilcox is the oldest formation (and farthest inland from the coast line); next come the Yegua; then Frio; and finally Miocene, the youngest (and nearest the coast line).

Why does the Wilcox produce in the belt it does, and give you dry holes farther downdip? Why does the Yegua produce where it does, and not farther up or farther downdip; ditto the Frio and Miocene? You figure there must be a good reason why these oil fields occur in belts roughly parallel with the present shore line. Then you find that the sediments being deposited in the gulf today also fall into belts in a similar manner. This certainly suggests that you might find the key to understanding the "why and where" of these oil fields by studying the whys and wheres of the sediments being laid down today.

Where the Oil Fields Occur

This idea is strengthened by at least one other clue discovered in studying the thousands of wells already drilled, both dry and producers. The oil-field belt in any given formation seems to lie downdip at some point in between a nonfossiliferous outcrop and a highly fossiliferous phase of that formation still farther downdip. Given a condition of nonfossiliferous outcrop, then at some point downdip, you find conditions were right for the development of good reservoir sands and oil accumulated in them, along with a moderate amount of fossils. Farther downdip you find these sands shale out and the shale is full of fossils.

Then you check and discover that today the descendants of these same fossils are also found grouped in certain belts in the gulf. Furthermore, you find that the fossil belts tie in with certain belts of sediments that are being laid down. As a sedimentologist, you are pretty sure that the things happening in the gulf today are the same as the things that happened a long time ago. But now you've gone a long step further. Now you've got a lead to something that may explain where to hunt for oil.

The abundance of these fossils or their living descendants in any given spot serves as a rough index of the sum total of all conditions present when sediments are laid down. You know that the living organisms are affected by the temperature and salt content of the water, by the amount of muddiness, or clearness, and probably by several other less obvious conditions. But the $64 question is this: Which of these conditions also determined the presence of a favorable setup for oil formation and accumulation?

There might be several combinations that affected the origin and accumulation of oil. The only way you can find out is to study the living descendants of the fossils. You may find several condition combinations which will affect living organisms so that the results ars similar to those among the fossils in the oil belts. But if only one combination also checks with all the other conditions found around oil accumulations, then you can make a long step forward. You can be reasonably sure you have a list of conditions that includes mother nature's prescription for an oil accumulation. Your next job is to see if you can cross any items off that list, and still have the prescription for oil left in. With luck and hard work, you might be able to narrow down the list until you find certain key conditions that are always present around oil belts, and always absent elsewhere.

Once these key conditions are disentangled in the comparatively simple relationships in the Gulf of Mexico embayment, you can apply them to more complex basins. Judging from past experience in other fields of science, any fundamental relationships found in the gulf should at least help you in solving similar problems in more complex basins in other parts of the world.

There is another urgent factor that is likely to encourage expansion of sedimentology research in the gulf. That factor is the increasing tempo of offshore exploration.

Offshore wildcat drilling costs much more than similar work on land. To keep costs within reason, you need sharper exploration tools. With fewer wildcats you must try to find just as much oil as a larger number of wildcats discovered on land. Or the same number of offshore wildcats must find you more new fields. The chances of saving the cost of one unnecessary dry wildcat by supporting group research look reasonably good for any operator. For a major company, the chances of saving several dry holes look equally good. The probable returns from an investment in group research look very promising when an offshore wildcatting campaign is part of your program.

A marine laboratory is the logical place to start studying your problems in this line of research. At present there are five marine laboratories of varying size and scope around the gulf. The locations are: Aransas Pass, Tex., under University of Texas, Rockport, Tex., under the state fish and game commission; Grand Isle, La., under Louisiana State University; one recently established by the state at Ocean Springs, Miss., and one at Coral Gables, Fla., under Miami University.

One or more of them might well serve as a base or bases of operation in a program of research in sedimentology. You may yet go to a marine laboratory to get the answer to the question—"Where should you look for future oil fields?"

Reduction of Installation Cost and Increased Gas-Pumping Capacity Achieved by Use of

COMPRESSOR CYLINDER CLEARANCE

*by W. R. Barrett**

THROUGHOUT the history of the natural-gasoline and gas-pipe-line industries, one of the most important problems involved in the design and operation of compressor plants has been and still is that of sizing compressor cylinders to best take advantage of available or anticipated operating pressure conditions.

In practically every instance where a new field has been developed and to a great extent where new installations have been made in an old field, the designer of the compressor plant has been confronted with the problem of comparatively large gas volumes, obtainable under relatively high suction pressure; whereas, he must anticipate that eventually the gas will have to be taken at atmospheric pressure or below.

Generally speaking, in the natural-gasoline industry, the designer and operator of compressor plants can only justify installation of that equipment which he is reasonably sure will be loaded throughout the period of time required to retire the investment, which results in large volumes of gas being vented to the air in the early stages of operation, and serious damage to compressor equipment which is overloaded in an effort to handle as much gas as possible. At a later date it is impossible to utilize the available installed horsepower due to decline in suction pressure. Whether the decline is due to the producers demanding lower pressure or is due to extended gathering-system and excessive pressure drop, the result is the same.

In some cases, due to continual development of new wells, the gas volume may have held fairly constant but due to extended lines and excessive pressure drop, suction pressure has declined, necessitating installation of additional compressor units, changing to larger-size compressor cylinders, or converting to two-stage compression in order to maintain volume and utilize the horsepower available in the driver or power end of the compressors.

Whether one, two, or all three of the last-mentioned procedures are considered, it is difficult to justify the additional investment in equipment and piping changes in the face of anticipated further decline.

In the early years of the industry, it was generally believed that any clearance in a compressor cylinder in excess of that required to avoid actual interference of reciprocating parts resulted in waste of horsepower. The purchaser of compressor cylinders demanded close clearance and maximum volumetric efficiency, while the compressor manufacturers used close clearance as one of their most effective sales arguments. Compressor cylinders were built with valves in the head, valves in hollow piston rods, and other ingenious devices to give clearance as low as 1 per cent. In reality these close clearances actually resulted in considerable waste of horsepower due to insufficient valve area and excessive pressure drop, while extremely high terminal pressures, which control the reexpansion curve, resulted in lower volumetric efficiency than if more clearance and greater valve area had been provided.

Close Clearance Not Essential

In later years it was more or less generally recognized that close clearance was not absolutely essential and manufacturers began building compressor cylinders with valves in the cylinder barrel where it was possible to obtain much greater valve area which reduced pressure drop and terminal pressures. Cylinders were then generally accepted with clearance from 3 to 5 per cent.

There were still many engineers, operators, and designers of compressor plants who believed close clearance was desirable and who purchased only cylinders which had minimum clearance; however, in a short time many designers and operators, after considerable experimentation, mostly of the trial-and-error nature, came to the conclusion that in order to make their compressor-plant operations more flexible and to take advantage of variation in suction pressure, it was desirable to provide some means of increasing cylinder clearance and as a result began using outside clearance pockets of various types. Some were fixed-volume type, some adjustable, some were installed in the outer head only, some in both heads, and some in one or both ends

*Phillips Petroleum Co., Bartlesville, Okla. Summarization of presentation at Panhandle-Plains regional meeting of Natural Gasoline Association of America, December 10, 1948, Amarillo, Tex.

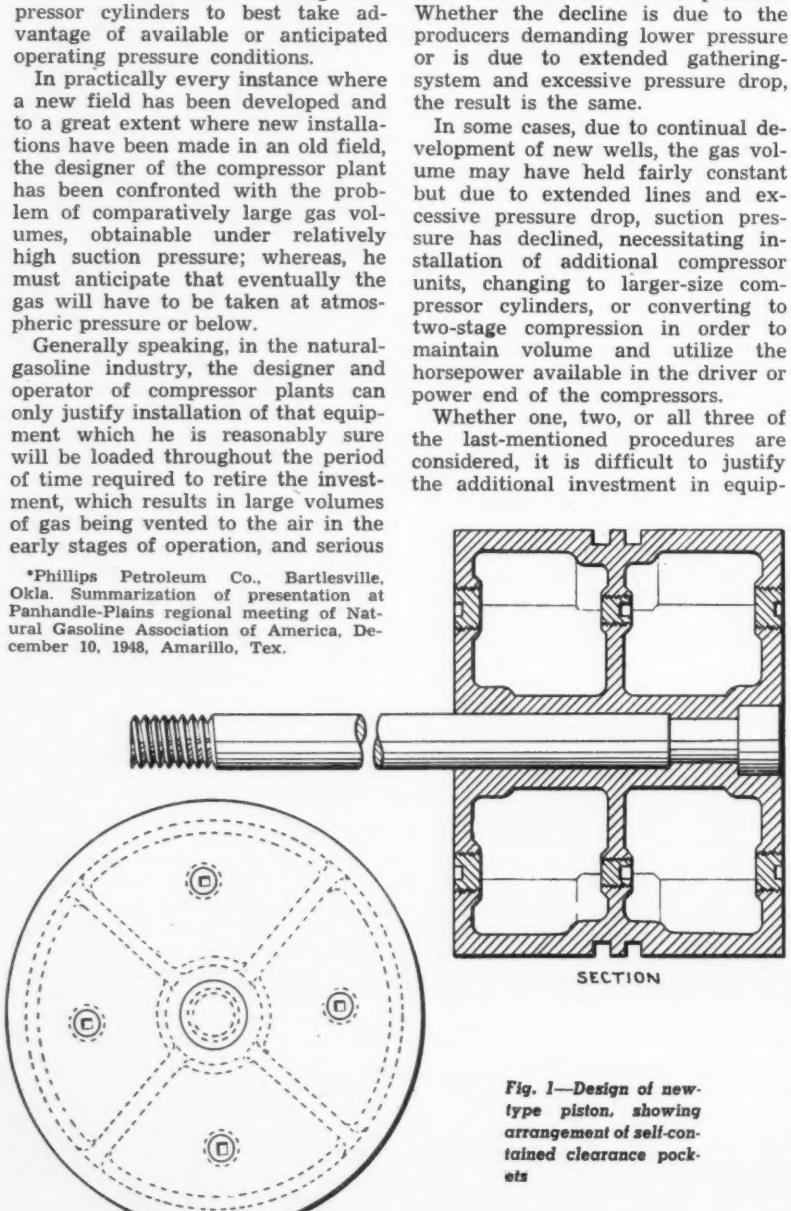

Fig. 1—Design of new-type piston, showing arrangement of self-contained clearance pockets

of the cylinder barrel. But, generally speaking, all of these were calculated to take care of only a limited amount of variation in suction pressure and most of the industry still believed that, although the added clearance resulted in pumping more gas without overloading the driver or power end, there was still a waste of horsepower and that better results would be obtained by changing compressor cylinder size. They also found all of these outside clearance pockets rather expensive, especially if it was necessary to change the size periodically.

No Effect on Horsepower

In recent years it has been proved conclusively that the amount of clearance in a compressor cylinder has practically no effect on the horsepower requirements except where clearance percentage is so low high terminal pressure or excessive valve pressure drop is encountered. As a result, more and more compressor-plant designers and operators are including in their specifications relatively large cylinders with clearance-pocket openings and in many cases large clearance pockets attached to the cylinder head or cylinder barrel to provide for at least a limited flexibility with respect to suction pressure and volumetric efficiency.

Most of these installations, while highly desirable, are quite expensive, especially where any great amount of clearance is involved. In many cases cost of the clearance equipment is so high and benefits so limited that the operator could probably justify a change in cylinder size instead. There have been many cases where expensive adjustable clearance devices have been purchased and installed when, in reality, a fixed clearance arrangement would have been more desirable since the adjustable feature was never used and fixed clearance would be much cheaper.

In the case of the modern multi-cylinder compressor units, the compressor cylinders in numerous instances, especially where large sizes are used, are so close together that outside clearance pockets can be installed in the outer head only, which creates an unbalanced condition causing excessive vibration. In many instances, operators of compressor plants have resorted to complete unloading of one end of double-acting cylinders by simply removing the suction valves in order to take advantage of higher suction pressure. In this case a considerable portion of the gain by reason of the higher suction pressure is offset by the horsepower lost in the unloaded compression chamber. Tests have proved this loss to be from 4 to as much as 15 hp. per cylinder depending upon the cylinder size or displacement and the compression ratio. In many cases this loss has, no doubt, been overlooked when calculating the load, resulting in serious overloading of the driver or power end of the unit.

Oil, gas, and gasoline companies throughout the country have hundreds of compressor cylinders in storage deteriorating, many of which are being junked because they are of sizes not immediately usable. Many of these cylinders have no openings for adding clearance and, therefore, are worthless unless they happen to be just the size needed. In the meantime, these same companies are perhaps purchasing new compressor cylinders of the required displacement to fit the presently prevailing operating pressure condition.

What the industry has needed all along is some development whereby the original installation of compressor cylinders could be the maximum size or displacement which would ultimately be needed to take the gas at minimum anticipated suction pressure and still keep the driver or power end loaded, and at the same time provide a means of reducing cylinder efficiency so that the large volume at relatively high intake pressure available in the beginning could also be handled without expensive cylinder and piping changes; keeping the driver or power end loaded at all times and pumping maximum volume per horsepower installed.

Some manufacturers are presently offering compressor cylinders with removable wet-type liners which provide a means of changing cylinder capacity within certain limits by replacing the liner and piston but this involves considerable labor, parts, and time down which makes capacity changes rather expensive.

New Piston Design

A compressor piston has recently been developed incorporating clearance pockets within the piston which is readily adaptable to any compressor cylinder having a cored or hollow piston, or whose piston is large enough to allow space for such pockets. The area inside the piston is divided by appropriate partitions into separate pockets of size and number deemed most suitable for the particular size cylinder involved. Part of the pockets may be opened to serve as additional clearance for the head end of the cylinder, part for the crank end as desired, and clearance arrangement may be changed at any time by simply removing or replacing a plug, which may be accomplished by removing a valve, without removal of the cylinder head.

These clearance-pocket-type pistons may be installed in a cylinder at a cost slightly greater than the cost of conventional pistons, representing only a small fraction of the cost of changing cylinders, considerably less than that of any type adjustable pocket of comparable capacity and even cheaper than the conventional bottle-type fixed clearance pocket of equal capacity, can be fabricated.

The operator has the added advantage that the clearance is inside the cylinder out of the way and volumetric efficiency may be changed at any time by one or two men in a few minutes. There is no maintenance cost involved and the clearance when used is practically 100 per cent effective. In other words, when additional clearance is used, the reduction in volumetric efficiency will be almost exactly the expected or calculated amount.

Usually, where other conventional-type clearance pockets are used, the added clearance volume is not fully effective and it is difficult to calculate with any great degree of accuracy the amount of clearance needed. The reason the piston pockets are more effective is that the opening or passage between the clearance area and the compression chamber being out in the flat area of the piston, gas enters from all directions, the passage is of ample capacity and being short, the restriction or pressure drop is negligible. A pocket on the side of a cylinder involves a long passage through the cylinder wall and water jacket and the gas from the entire area of the piston must travel to one side where the passage is obstructed near the end of the stroke by the piston itself. A pocket installed in the outer head has the advantage of being out in the center, the gas enters from all directions and flow is not restricted by the piston; however, it is objectionable due to the long passage through the water jacket and the fact that clearance is only applied to one end of the cylinder which results in an unbalanced condition and excessive vibration.

Actual Example

An example of actual application of clearance through the use of these pistons is presented to demonstrate their adaptability.

A gasoline plant was to be constructed involving thirty-five 250-hp. twin horizontal gas-engine compressors. Original specifications called for 0 psig. intake pressure and 55 psig. discharge pressure and the calculated capacity was 87,500 M.c.f. at 13.45.

The company had on hand 17 by 20-in. (Clark Type S) compressor cylinders which they decided to use. Calculations indicated that 0 lb. intake on these cylinders would overload the power end making it necessary to reduce the intake pressure to 5-in. vacuum which obviously would reduce the capacity, or provide additional cylinder clearance which could not be done because the cylinders had no openings through which added clearance could be applied. The 17-in. cylinders were installed and after starting operation the compressors

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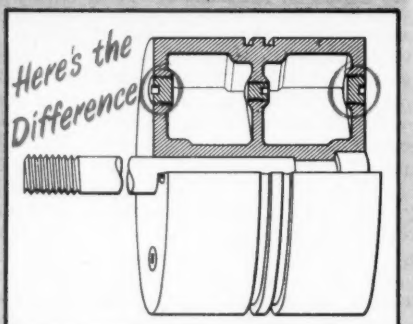
Most economical method of changing the volumetric efficiency of your reciprocating compressors

$ How would you like to save $79,000?

The simple new clearance pocket compressor piston has already done that in one gasoline plant. Here's how it happened. Thirty-five 250 HP twin compressors were in use with 17" x 20" Clark type "S" cylinders. Increasing operating pressure would formerly have required the installation of replacement compressor cylinders at a cost of $90,000 to $100,000. Installation of the new clearance pocket pistons gave the desired operating results at a cost of only $11,000 — *a clear saving of at least $79,000!*

The installation of these new clearance pocket pistons provides you with ten worthwhile advantages whether your anticipated operating pressure is *higher* or *lower* than at present:

1. **Allows you to install compressor cylinders of maximum displacement to take your gas at the lowest anticipated suction pressure.**
2. **Allows you to utilize your present cylinders and reclaim your old cylinders which have no provision for added clearance.**
3. **Allows you to change your volumetric efficiency over an exceptionally wide range.**
4. **Allows you to keep your power end fully loaded at all times.**
5. **The clearance pockets require no maintenance.**
6. **Permits easy, rapid changing of cylinder clearance by changing plugs through valve ports. Time required — only a few minutes.**
7. **The variable clearance is *inside* the cylinder, not external.**
8. **Added clearance is practically 100 percent effective.**
9. **Added clearance is in both head and crank ends of your cylinder. No vibration is induced by uneven pumping load.**
10. **Best of all, these advantages are yours at a small fraction of the cost of changing cylinders or adding compressors.**



Sketch shows cutaway clearance pocket piston. Note the main central web dividing the piston interior into two chambers. Each of these main chambers is subdivided into four pockets. Opening or closing these with plugs in piston heads varies compressor cylinder volumetric efficiency. Clearance pockets are ideally located for efficient loading and unloading.

Clearance pocket pistons are available with new cylinders or as replacement pistons from:

Clark Brothers Company
Olean, New York

The following shops are licensed to manufacture the pistons locally. They can furnish clearance pocket pistons to fit any cylinder of any make, size or type in which the piston is large enough to accommodate the pockets.

Baash Ross Tool Company —
Pampa, Texas, and
Los Angeles, Calif.
Oklahoma City, Okla., and
Houston, Texas

Midwest Machine Company —
Oklahoma City, Okla., and
Odessa, Texas

Eureka Tool Company —
Oklahoma City, Okla.

66

For additional information address:

PERCO DIVISION

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Chemical Cleaning of Heat-Exchanger Equipment

by C. M. Loucks and C. H. Groom†*

THE successful removal of any type of deposit with solvents is naturally dependent upon the nature of that deposit. In solvent cleaning of heat-exchange surfaces the deposits for purposes of identification are first divided into one of three broad classes:

Inorganic deposits.

Organic deposits.

Mixtures of inorganic and organic deposits.

Inorganic Types

The inorganic deposits consist of a comparatively small number of specific chemical compounds, which may be designated by chemical or mineral name and by chemical formulas. The possible constituent metals must be limited to those cations present in the water or fluid medium or formed from the metals with which the fluid medium comes in contact. The negative ions or anions will be those present in or derived from the fluid medium.

For example, if a well water is used as a cooling medium in a system consisting of steel pipe and a heat exchanger constructed with cast-iron channel sections and copper-alloy tubes and tube sheet, one may list the possible positive and negative ions to be expected:

From Water

Metal ions	Negative radicals
Ca	$CO_3^=$ HCO_3^-
Mg	SO_4^-
Na	$Cl^=$
K	$S^=$
Fe	Oxygen $OH^=$
Mn	Silica

By Corrosion Attack on Metal Surfaces

Fe	
Cu	
Zn	

It would be possible to discover in the deposits such compounds as are insoluble in water under the conditions existing in the system:

Carbonate or basic carbonate	of—Ca, Mg, Fe, Mn, Cu, Zn
Sulfate	of—Ca
Oxide or hydroxide	of—Fe, Mn, Cu, Zn
Silicate	of—Ca, Mg, Fe, Mn, Cu, Zn
Basic chloride	of—Cu
Sulfide	of—Fe, Cu, Zn

Further, if chemicals are being added to the system for corrosion control (phosphates, chromates, silicates, etc.) or for any purpose whatever, compounds containing these anions may be found in the deposits.

Organic Types of Deposits

Organic materials may be found on water sides of tube-and-shell units under operating conditions where:

1. The water or steam are contaminated with oil or other organic matter.

2. Conditions are favorable for the growth of living organisms such as slime or algae.

However, typical organic-type deposits are generally associated with the product sides of exchanger units in oil refineries, coke plants, chemical industries, etc.

Organic deposits generally consist of not one or two but hundreds and probably thousands of organic compounds. The effect of heat, pressure, moisture, and other physical chemical factors can produce a great variety of organic deposits. The organic deposit may be anything from a light volatile fluid, to a highly polymerized material or decomposed coke-like deposits which appear to be untouched by the solvents usually employed for solvent cleaning. Petroleum refineries, byproduct coke plants, synthetic-rubber plants, the fermentation industry, food-processing industry, the chemical industry, and others have problems with organic deposits.

Because of the almost unlimited variety of organic deposits, identification for purposes of chemical cleaning may be generalized as follows:

1. Of vegetable origin
   - Saponifiable
   - Nonsaponifiable
2. Of petroleum origin
   - Soluble in carbon tetrachloride
   - Insoluble in carbon tetrachloride
3. Of coal origin
   - Soluble in benzene or pyridine
   - Insoluble in benzene or pyridine
4. Miscellaneous

The above classifications for organic deposits are not entirely satisfactory. However, since no attempt can be made to classify these materials by their chemical identities, it becomes desirable to characterize them on the basis of some simple descriptive laboratory tests. The fundamental problem is to determine whether the deposit can be dissolved in a suitable organic solvent or dislodged and dispersed in an aqueous

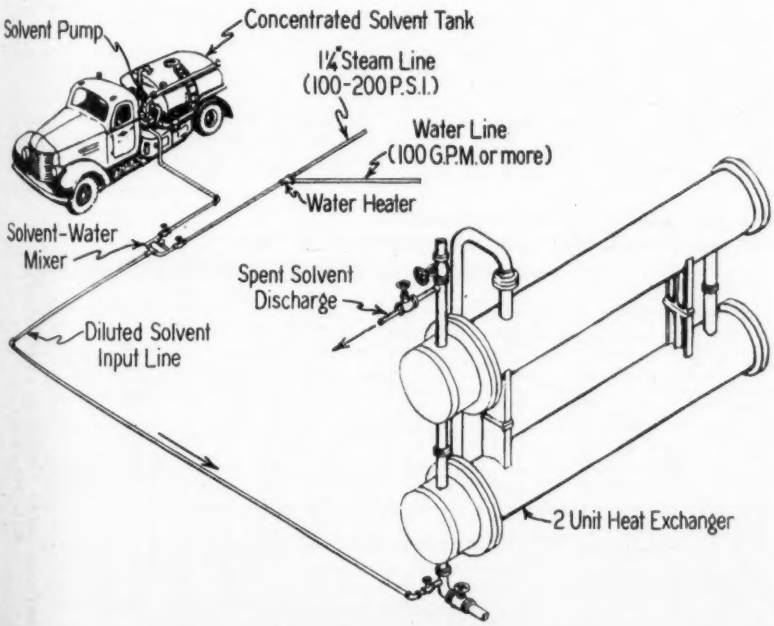

Fig. 1—A typical hookup for the chemical cleaning of heat-exchanger equipment schematically illustrated. The essential components in order properly to carry out the operation are indicated

*District chemist, Dowell Incorporated, Cleveland, and C. H. Groom,† development engineer, Dowell Incorporated, Tulsa. Summarization of paper presented at the annual meeting, New York, November 28-December 3, 1948, of American Society of Mechanical Engineers.

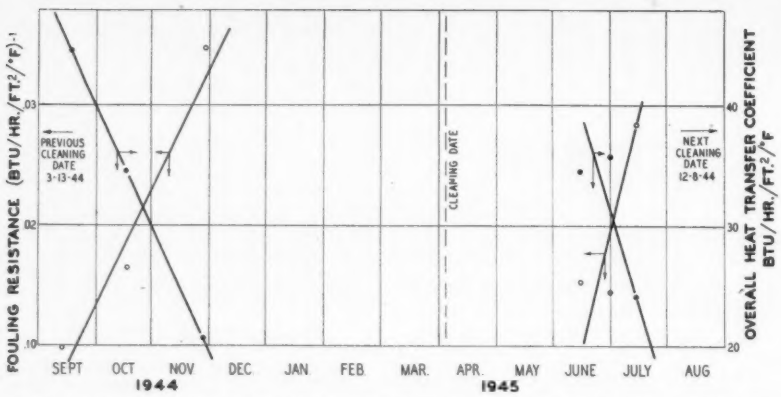

Fig. 3—Absorption-oil coolers. Fouling resistance and over-all heat-transfer coefficient versus time

and still are mechanical. The general cleaning procedure is outlined briefly as follows:

Shell Side Washed and Steamed

After the unit has been shut down or the exchange equipment bypassed, and before the exchanger shell is unheaded, the shell side of the bundle is thoroughly washed with water and steamed. This serves to wash away most of the loose and soluble deposits and to soften the remaining deposits. When both sides of the exchanger have been drained and the shell side washed, the exchanger heads are removed, and the bundle withdrawn from the shell.

If the tube side is partially fouled or plugged, an exchanger-tube scraper is used to ream the tubes. This scraper consists of a hollow shaft with an outer diameter slightly less than the inner diameter of the exchanger tubes. A steel cutting bit is welded to one end of the shaft, and just below this bit are wire springs which scrape the walls of the tube. Either liquid (gas, oil or water) or gas (steam or air) may be charged through the shaft as the scavenger agent. The flushing medium is discharged through the shaft at the points where the springs are attached.

The shaft rotates at about 700 r.p.m. while it is being pushed through the tubes. In the event a tube is plugged to such an extent that the tube scraper cannot be forced through, special vibrating equipment is attached to the shaft. The shaft rotation is increased to 3,500 r.p.m. while, at the same time, light hammer blows are applied to the shaft at the rate of 1,900 times a minute.

Hand Scrubbers Used

For cleaning the shell side of the bundles, hand scrapers are utilized. These scrapers are thin bars of steel, 1 in. wide, ⅛ in. thick, long enough to extend through the bundle, and usually serrated on one side. The scrapers are inserted between the rows of tubes and are worked back and forth the length of the bundle. The deposits are scraped off and fall onto baffles or other tubes. The bundle is periodically blown with air or steam during the scraping operation in order to remove the loosened deposit. The scraping and blowing is continued until all scale and deposit have been removed from the shell side of the tubes.

The one instance of chemical cleaning which is covered in this report is the use of sodium hydroxide solution (5-10° Be.) in cleaning the shell side (gas oil) of gas oil-catalyst slurry exchangers. The four exchangers are cleaned, two at a time, without shutting down the unit or pulling the bundles. The caustic is circulated through the shell, while steam is passed through the tubes. After the caustic circulation, the bundles are washed and steamed water-dry in about 1½ hours. It was found that if the caustic temperature were kept near its boiling point better cleaning resulted. The washing period was originally 24 hours long, but was gradually reduced to 6 hours.

Mechanical Methods Adequate

An inspection of the graphs of the rates of fouling and changes in heat transfer coefficient reveals the expected general trends, i.e., increase in fouling and decrease in transfer coefficient with time.

The mechanical methods of cleaning which have been used appear to be adequate, considering the structural characteristics of bundles. The man-hour requirements for cleaning the outside of the tube bundles by scraping methods are high, but it is usually necessary to employ these methods in order to obtain satisfactory results. We have found limited application for cleaning the shell side of heat exchangers by caustic washing. The gas oil-catalyst slurry exchangers are cleaned by this method. The use of caustic solution in maintaining clean gas-oil preheaters without pulling the bundles has resulted in decreased idle time for cleaning and inspection, and at the same time a higher level of heat transfer.

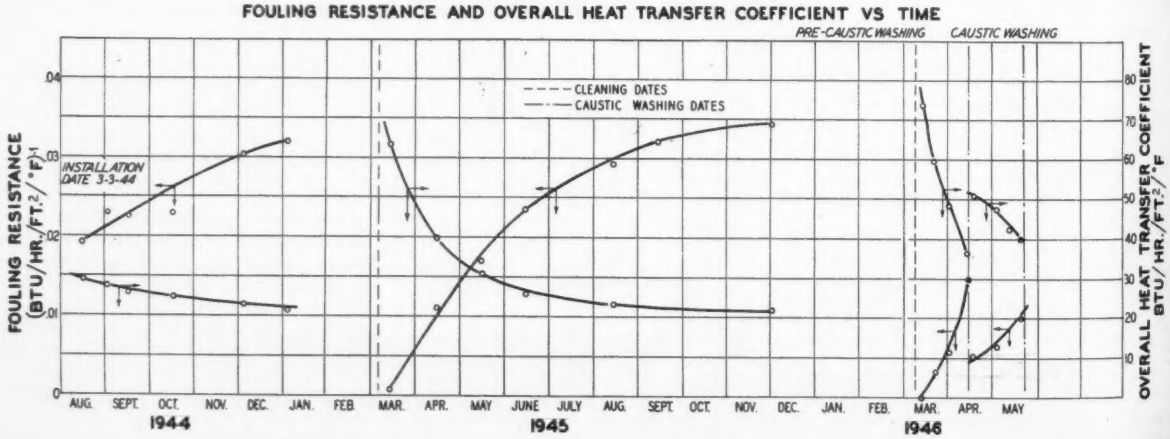

Fig. 4—Gas-oil catalyst slurry exchangers. Fouling resistance and over-all heat-transfer coefficient versus time

HEAT EXCHANGER MAINTENANCE

A SYMPOSIUM

Rates of Fouling and Cleaning of Unfired Heat-Exchanger Equipment

by J. H. Weiland, Jr. R. C. McCay,* J. E. Barnes**

IN an effort to provide useful data on fouling and methods of cleaning of unfired heat-exchange equipment, data were developed from test runs and survey periods. The types of heat exchange services which were considered are: (1) cycle fuel-oil heated naphtha reboilers, (2) depropanizer reflux condensers, (3) absorption-oil coolers, and (4) gas oil-catalyst slurry exchangers.

Graphical presentations of the over-all heat transfer coefficients and fouling resistances are shown in Figs. 1 to 4, inclusive. In all cases, only data with comparable operating conditions were used. The flow rates and entering temperatures, as well as unit conditions, were maintained as constant as possible throughout the report data. All calculations were made on the basis of correlations available to The Texas Co.

*The Texas Co., Port Arthur Works, Port Arthur, Tex. Paper presented at the annual meeting, New York, November 28-December 3, 1948, of American Society of Mechanical Engineers.

A brief discussion of the types of fouling in each of the services mentioned above are:

1. Cycle fuel-oil heated naphtha reboilers.

Inside the tubes, coke is deposited in loose form, and usually may be removed by punching, blowing, sandblasting and washing. The shell-side deposit is usually not heavy and does not result in plugging between tubes. Water which may enter the shell side of the reboilers has caused rust formation.

2. Depropanizer reflux condensers.

The insides of the tubes remain fairly clean as long as sufficient clean water is available. During prolonged periods of dry weather, the sediment content of the cooling water increases, resulting in additional tube-side fouling. Light hydrocarbons leaking into the cooling-tower return streams gives rise to a stable emulsion which tends to plug the tubes. This is usually removed by washing each tube individually with a stream of high-pressure water.

The shell-side deposit consists of a loose flaky scale, composed mainly of metal sulfides. Although fairly easily removed from the outside of the bundles by washing, the scale plugs the spaces between the tubes and must be removed by hand scraping methods.

3. Absorption-oil coolers.

The sediment deposits in the tubes are usually removed by washing each tube separately with a stream of high-pressure (150-psi.) water. The shell-side fouling material is a loose scale which is removed to a large extent by washing and the remainder removed by scraping. The shell sides of the bundles are washed with water one time between semiannual test and inspection down periods. This prevents the scale from plugging between the tubes.

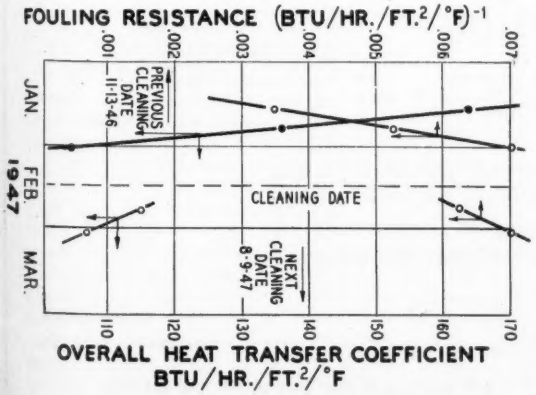

Fig. 1—Cycle-fuel-oil-heated naphtha reboilers. Fouling resistance and over-all heat-transfer coefficient versus time.

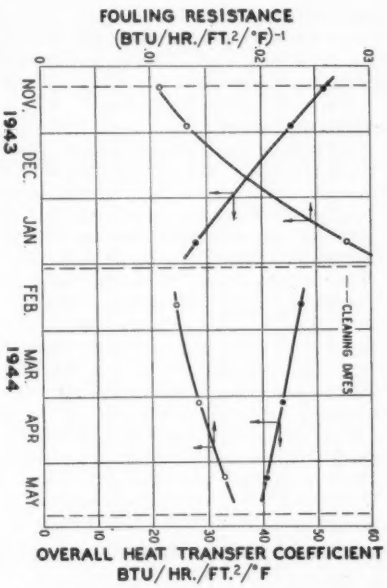

Fig. 2—Depropanizer reflux condensers. Fouling resistance and over-all transfer coefficient versus time

4. Gas oil-catalyst slurry exchangers.

The fouling material on the shell side of the bundles consists of a viscous gummy sludge which is tenaciously held to the surface of the tubes. This sludge is acidic in nature, but if washed with caustic solution the acidic components are neutralized and the sludge disperses into hard particles which may be removed by caustic circulation and subsequent water washing. If the sludge is allowed to remain on the tubes over an extended period it tends to harden and seemingly is more difficult to remove by caustic washing. The practice at Port Arthur Works is to caustic wash at monthly intervals.

With but one exception, the exchanger bundle cleaning methods were

were seriously overloaded in an effort to avoid waste of gas.

In the meantime, the gas volume steadily increased and it developed that the producers required some 15 psig. on their oil and gas separators and there was no objection to holding 6 or 7 psig. on the compressor suction header at the plant. It appeared that it would be necessary to either install 70 new compressor cylinders of a smaller size to take the gas at the higher intake pressure, or simply install more compressors to handle the gas which would otherwise be vented to the air. New cylinders would cost $90,000 to $100,000 and to get the same result by adding more compressor units would cost a great deal more.

Clearance-pocket-type pistons were installed at a cost of approximately $11,000, and by using only 62.5 per cent of the clearance available in the pistons, the intake pressure was raised to 7 psig.; the discharge pressure remaining at 55 psig., the gas-pumping capacity was increased approximately 20 million cubic feet daily and horsepower requirements were reduced to well within the rating of the units. By using the remaining available clearance in these pistons the intake pressure could be raised to a maximum of 14 psig. without overloading the engine.

Most of the 17-in. compressors cylinders installed in this plant had been rebored and fitted with new conventional-type pistons; had the clearance-pocket-type piston been used instead, the cost would have been only $2,500 more than the cost of the conventional pistons.

Clark Brothers Co. is manufacturing these pistons at present and other compressor manufacturers can probably furnish them if requested.

The following shops are licensed to manufacture the pistons locally for replacement purposes, and can furnish them to fit any cylinder in which the piston is large enough to accommodate the pockets: Midwest Machine Co., Oklahoma City, Odessa; Baash-Ross Tool Co., Pampa, Houston, Oklahoma City, Los Angeles; Eureka Tool Co., Oklahoma City.

BOOKS

OIL AND PETROLEUM YEAR BOOK. Compiled and published by Walter E. Skinner, 20 Copthall Avenue, London E.C. 2, England. $4, post free abroad.

The 1948 edition, the thirty-ninth year of issue of this standard reference work, gives complete and up-to-date particulars concerning 660 companies operating in all parts of the world and covering all branches of the oil industry. The particulars of each company comprise names of directors and other officials, where operating, description of business, crude-oil production, refinery runs, details of capital, dividends, and financial results. Other useful features are names and addresses of 352 managers and engineers and the names of companies in the book with which they are connected, and the Buyers' Guide of Manufacturers of oil-field and refinery equipment comprising more than 600 headings.

OIL AND GAS FIELD DEVELOPMENT IN UNITED STATES YEAR BOOK 1948 (REVIEW OF 1947), VOL. XVIII. Published by the National Oil Scouts and Landmen's Association, Box 1095, Austin, Tex., 897 pp. with tables, maps, geologic columns, and diagrams. $7.50.

This book has become an annual "must" for oil men who wish to have in handy reference form, a summary of all the high spots of all the scouting and land information accumulated during the preceding year for all active areas, by the industry's information branch. This year's volume has some data on 40 states; only the 6 New England states plus Minnesota and Wisconsin being excluded for lack of some news.

In condensed form it reports the various factors that made up the greatest exploration campaign in the industry's history prior to 1948. In addition it contains, in tabular form, the names, production records, geological data, and available reservoir-engineering data on practically all the important oil fields in the United States.

For many areas, particularly some of the more active ones, the data given go beyond exploration and production, to show pipeline outlets, sometimes pipe-line runs by companies, and perhaps steel storage. Lists of refineries and natural-gas-processing plants are included for some of the important districts.

The exploratory data usually give information on the year's active leasing campaigns and large acreage blocks held by various companies. Information on geophysical prospecting activity, how much and in what general part of the district is compiled for many areas. Wildcat drilling and the results thereof are covered extensively; new field discoveries, new pays, and important extensions to old fields are listed, and for many districts a listing of all dry-hole wildcats. Geological columns, maps, and cross-sections are used extensively.

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TABLE 1—PROPERTIES OF METALS ENCOUNTERED IN CHEMICAL CLEANING

Ferrous Metals

Cast irons can be cleaned with any of the common solvents used for that purpose. When using inhibited acid, however, it is advisable to use lower temperature limits than for low carbon steel.

Carbon and low-alloy steels offer good resistance to cleaning solvents, including inhibited acids at rather elevated temperatures. However, it must not be assumed that all carbon and low-alloy steels exhibit the same corrosion characteristics in inhibited acids.

Stainless steels are in general, more resistant to corrosion than low-alloy steels. This particularly is true of the 18-8 types of chromium-nickel alloys. This is less true of the chromium stainless steels. Care should be exercised in the use of inhibited acid in contact with the latter.

Galvanized iron cannot be cleaned by either inhibited acids or strong alkalies. Neither should be used unless corrosion has already so nearly destroyed the galvanized coating that its complete removal is of no consequence.

Copper and Copper Alloys

Copper and copper alloys are in general resistant to nonoxidizing acids, alkalies, and organic solvents.

Nickel and Nickel Alloys

Nickel and nickel alloys are resistant to nonoxidizing acids, alkalies and organic solvents.

Aluminum and Aluminum Alloys

Aluminum and aluminum alloys are becoming more extensively used in the fabrication of heat-exchange equipment. The solvent cleaning of such equipment must not be attempted with inhibited acid or with strong alkali. Strongly oxidizing acids and mild alkalies may be used.

Tin and Lead

Block tin is seldom encountered but is quite resistant to attack by the common solvents under the conditions employed. The same may be said of lead, which might be used for gaskets, caulking, or special fittings. Further, tin-lead solders are not subject to serious attack.

solvent sufficiently to effect its removal.

Mixtures of Organic and Inorganic Materials

It is not uncommon to find typical inorganic deposits in water and steam systems mixed with oil or grease, with living organisms such as slime, or various other materials which entered the system accidentally.

On the other hand, most organic deposits contain some inorganic material resulting from corrosion of the metals in the system. For example, in a petroleum refinery most organic deposits are mixed with the sulfides of iron or copper. Special chemical cleaning procedures may be necessary for satisfactorily dealing with these mixed deposits.

In solvent cleaning there are many solvents available. The number of practical solvents is limited, however, by cost, by fire and health hazards, and by the corrosive nature of the solvent. The type of solvent used in chemical cleaning is greatly influenced by the metals in the unit to be cleared. The relation of the metals to solvents is illustrated in Table 1.

In general, inorganic deposits are removed because the acid solvent reacts with the compounds in the deposit converting them to new compounds which are soluble in the aqueous solution.

Certain oxides present special problems: Cuprous oxide, because it is not readily soluble in low concentrations of hydrochloric acid, and manganese dioxide because, if it does dissolve in hydrochloric acid, it causes the liberation of free chlorine which can create a serious corrosion hazard.

Sulfides.—Iron sulfide dissolves readily but with evolution of hydrogen sulfide, a very poisonous gas, which must be handled with proper safety precautions in mind. Copper sulfides are not readily soluble. Zinc sulfide is intermediate in properties; it will dissolve readily under the proper conditions.

Calcium sulfate.—This compound, which is found much more often in boilers using raw water than in heat-exchange equipment, is difficult to remove. For all practical purposes it is only slightly soluble in hydrochloric acid. One method of treatment which is effective in some cases is to use alternate alkaline and acid stages. Some calcium sulfate deposits respond to treatment with hot strong caustic solutions but this method has not been widely used to date. The cost and danger of handling the solvent tend to discourage its use.

Silicates.—The chemistry of the silicates is rather complex. It will serve our purpose here to indicate that there are two general methods of removing difficult deposits:

1. The use of hydrochloric acid containing addition agents which increase the solubility of the silicates.
2. The use of alternate alkaline and acid stages.

Usually laboratory tests and previous experience will guide the engineer in deciding which procedure to use.

There are some other miscellaneous substances which are encountered infrequently, but the ones above are of most general interest and will serve well to illustrate the problems involved. One other may be mentioned only because it presents an unusual corrosion problem. Calcium sulfite will dissolve in hydrochloric acid but when it does, it forms a strong reducing agent, sulfurous acid, which destroys many of the organic-type inhibitors which are used in chemical cleaning. This may result in serious acid attack on the metal unit.

As suggested above, much of the task of removing organic materials involves physical changes rather than chemical reactions. Solution of the deposit in a suitable organic solvent or dispersion in aqueous medium are the most common methods.

The chemical reactions involved include:

(a) Saponification by strong alkali.
(b) Oxidation by alkaline or acid solutions containing strong oxidizing agents.
(c) Reaction with concentrated sulfuric acid.

These few chemical generalizations are sufficient for this discussion.

Fouling Rates in Heat Exchangers

by Robert C. Butler* and William N. McCurdy*

Introduction

FOULING of exchangers and other refinery equipment costs refineries considerable sums each year in decreased capacity and lost heat, in addition to the actual cost of cleaning the equipment. Refinery experiences with rates of fouling, means of reducing fouling rates, and methods of cleaning exchanger equipment in various services are studied in determining the correct equipment design for new plants and in solving fouling problems in existing plants.

Reduction in Fouling

Experiences by refineries with various fouling services and the methods used to reduce the fouling will be described below, according to causitive items. The methods used to alleviate in one case may not apply

*Process engineers, Standard Oil Development Co., Linden, N. J. Paper presented at the annual meeting, New York, November 28-December 3, 1948, of American Society of Mechanical Engineers. Section of paper dealing with correlation of fouling resistance with time not included.

directly to another case. Use of laboratory facilities to determine the nature of the deposits is desirable.

Fouling from caustic soda. — The feed preheater of an isobutane tower was fouling. Analysis indicated caustic soda deposits. Local water washing of the light-hydrocarbon feed stream greatly decreased the rate of fouling.

Fouling from salt in crude. — Salt deposited from crude due primarily to vaporization of the water has been a cause of decreased heat exchange and increased pressure drop in exchangers. Settling in feed tankage is desirable to reduce the quantity of salt solution, but it is not economical beyond a certain point due to the tankage required. Desalting by mechanical separation, such as brine addition to the crude to secure coalescence, followed by settling, or water addition followed by bed filters, is an acceptable process for some crudes. Good results may be secured by electrical desalters. Competition is resulting in decreased costs of the electrical method.

In view of the initial investments and operating costs involved in designs for new plants, studies must be made to determine if desalting equipment should be provided, or if pressure-temperature control of the crude is the economic choice. The latter method has been used in a number of refineries. Sufficient pressure is imposed on the crude to minimize vaporization of water and consequent salt deposition in the heat exchangers preceding a flash drum. When the crude has been preheated to a temperature of 300°-350° F., the pressure is reduced immediately preceding the drum, and in the drum a large portion of the water is vaporized. Hot feed pumps are then used to pump the flashed crude through the subsequent exchangers and the furnace. By this procedure the fouling which otherwise would occur is greatly reduced. Calculations and refinery experience have been used in determining the optimum pressure-temperature relationship.

Fouling from leached brickwork.— In an isobutylene-extraction plant, the sulfuric acid was being reconcentrated at about 300° F. in a brick-lined concentrator. Subsequently, acid is mixed with hydrocarbons. Heat of reaction is removed by emulsion coolers. The coolers fouled so seriously that cleaning was necessary every 2 to 3 weeks. Analysis of the deposits indicated iron and aluminum salts resultant from leaching of the brickwork and from corrosion products. Emulsion velocities in the tubes were not a factor as in test equipment fouling occurred at emulsion velocities of 16-18 ft. per second. Reynold's numbers were about two cycles above the transition region. After equipment was installed to permit vacuum concentration of the acid at about 175° F., fouling of the exchangers greatly decreased and the interval between cleanings was extended to more than 3 months.

Fouling from oxidation products.— Plant feed streams which have previously been processed, such as gas oils and naphthas, readily pick up oxygen in tankage. These streams deposit gums on the heat-exchanger surfaces, particularly when being heated through the region from 250° to 450° F. In a hydroformer plant running a 200°-270° F. boiling-range naphtha, it had been necessary to clean the feed exchangers every several weeks, as the pressure drop would increase to 100 psi. during that time. To improve this situation natural gas was used to blanket the feed tankage, and as a result it was feasible to extend the interval between cleanings to 60 days.

In some cases, the feed to a unit consists of several mixed stocks, and blanketing of all feed tankage is not practical. Further, experience has indicated that blanketing with natural or inert gas is not totally effective, nor is the use of floating-roof tankage. Stripping the unit feed, as it is charged to the unit, with an oxygen-free gas, including steam, is effective.

The combination of the potential gum content and the oxygen content of the oil feed is an indication of the fouling tendency of the feed. The amount of deposit resulting from passing a sample of the feed through a glass coil submerged in a hot-oil bath is a dependable means of determining if fouling of the plant heaters would be expected, and if feed stripping should be considered.

Relative to oxygen content, it was found that naphtha and gas oil in normal refinery handling could readily dissolve oxygen up to about 0.002 per cent by weight, and tests showed that this amount of oxygen would cause severe fouling. If the oxygen content is reduced to below 0.001 weight-per cent in an oil otherwise free from gums or sediment, little difficulty will occur from exchanger fouling. In one gas-oil feed stripper, 24 ft. of ¾-in. Raschig rings were used. Stripping with 10 to 20 cu. ft. of natural gas per barrel of feed reduced the oxygen content from 0.002-0.005 weight-per cent down to less than 0.0004 weight-per cent. Previous to stripping, it was necessary to reduce the unit feed rate at the end of a month due to pressure drop limitations. After the feed stripper was put in service, the first year's operation resulted in negligible exchanger fouling.

Use of bleedoff in recirculating systems.—In one type of gas-absorption plant, the absorption oil consists mostly of recirculated oil, with small percentages of makeup oil as required. Lean (low-vapor-pressure) oil is contacted with wet gas, the heavier components of which are absorbed. The enriched oil is then passed through heat exchangers to stills where the absorbed gases are removed and recovered. The hot stripped oil is returned through heat exchangers to the absorption tower. Considerable fouling difficulties are often experienced in this type of recirculating absorption plant. Extensive laboratory and plant studies have been made. The fouling compounds form due to thermal oxidation of the unsaturates in the incoming gas stream. The oxidation is stepwise.

In the intermediate stages of the oxidation the partially oxidized materials are soluble in the absorption oil and have similar distillation characteristics which makes it difficult to separate them by distillation. These partially oxidized materials are readily soluble in concentrated sulfuric acid but not in caustic. As oxidation progresses, materials are formed (probably salts of organic acids or resin) which precipitate and adhere to metallic surfaces, particularly to the heating and cooling surface of the exchanger equipment.

Studies indicated that fouling was materially reduced by:

1. Eliminating oxygen or unsaturates from the system.

2. Contacting the recirculated absorption oil with concentrated sulfuric acid to remove the partially oxidized materials.

3. Maintaining a high makeup rate and discard of absorption oil to remove the partially oxidized materials before the oxidation has progressed to a point where precipitation takes place.

The refinery found that it was not economically feasible to remove oxygen or unsaturates due to the large amount of equipment and chemicals required (about 25 lb. of sulfuric acid per barrel of oil). Contacting the absorption oil with strong sulfuric acid to remove the partially oxidized materials was effective but expensive. For this particular refinery, it was feasible to use the third method of a high makeup and discard rate, since the discarded oil could be used efficiently as reflux in an adjacent pipe still. The discard rate is 700 bbl. per day. It should be mentioned the use of inhibitors was not successful.

Use of additives.—No definite information is available on the efficacy of adding gum inhibitors. It is reported one company by the injection of an inhibitor secured reduced fouling of the feed side of the slurry-feed exchangers of a catalytic cracking plant.

Addition of chlorine to cooling water.—Coolers and condensers foul

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on the water side causing increased pressure drops, inability to pass sufficient water through the exchangers, and decreased heat-transfer coefficients. Frequently fouling is due to algae growth. The algae growth adheres to the tube walls and forms a structure for the accumulation of silt. Control of the marine growth also is desirable relative to the performance of cooling towers. Various chemicals, including discarded sulfuric acid, copper sulfate, sodium hypochlorite, and chlorine have been employed to control bacteria activity and marine growth. Of these chemicals, chlorine is considerably preferable. Heat-transfer coefficients before and after chlorination for a shell-and-tube-type overhead naphtha condenser at a catalytic cracking plant are indicated in Table 1.

TABLE 1—EFFECT OF CHLORINATION

Before chlorination	
Days since cleaning	B.t.u./hr. × sq. ft. × °F.
0	42
8	30
53	25
100	23
153	22

After chlorination	
Days since cleaning	B.t.u./hr. × sq. ft. × °F.
0	43
16	36
36	41
64	42
112	41

From Table 1, it can be seen that there was practically no decrease in the heat-transfer coefficient during 4 months when the water was chlorinated. The water velocities in the tubes normally are 3 to 5 ft. per second. Experience before and after chlorination in various refineries has shown that, in general, the benefits to be derived from chlorination justify the investments and operating costs necessary. New refineries usually include chlorination facilities, and in many existing refineries, means of chlorination have been installed. In recirculated water systems, chlorine is added continuously to result in a residual chlorine content (in the water returning to the cooling tower) of 0.5 to 1 p.p.m. In once-through systems (such as salt-water systems) satisfactory control and economy of chlorine are obtained by intermittent injection. During the injection period of about 1 hour every 8 hours, sufficient chlorine is injected to result in about 1.5 p.p.m. residual chlorine.

pH control of cooling water.—In recirculated (cooling tower) water systems, the formation of carbonate scales may occur. Salt deposits of this type may be controlled by the addition of various chemicals. One refinery employs caustic and Hagan phosphates. Another has found that sulfuric acid is better for its type of water. In general, control of pH to a value of about 8 is desirable to control salt scale formation.

Cleaning Methods

Tube bundles are cleaned in place, and by withdrawing them from the shell. When the outsides of the tubes are to be cleaned, in-place cleaning requires the circulation of a solvent. Solvent circulation has limitations, since the correct fluid must be circulated to secure effective cleaning. It usually requires a local or portable tank and pump, and connecting lines. Its major advantage frequently is that it reduces down time of the plant. An extra 6 to 12 hours down time of a large plant will mean considerable money. A second advantage is that usually cleaning in place is less expensive with regard to labor and material costs. The disadvantage of solvent in-place cleaning is the uncertainty of results. When the inner surfaces of the tubes are to be cleaned, in-place cleaning may be done using either mechanical or chemical means.

When tube bundles are cleaned by withdrawing them from the shell, the plant down time may be kept to a minimum by having a spare tube bundle ready to install in the place of the dirty one. The fouled bundle then may be cleaned locally, or transported to a cleaning shop. Many methods are used for out-of-shell cleaning. These methods include mechanical cleaning with cleaning bars, scrapers, rods, drills, and brushes; also included are cleaning by immersion in a tank of solvent, sand blasting, the use of hydraulic jets or steam jets, and controlled burning when the deposit is mostly carbon. The choice of in-place or out-of-shell cleaning depends on the nature of the deposit, the degree of success with the method when previously used, and the local preference of the cleaning-gang foreman and supervising personnel.

One refinery has classified deposits into seven types, and employs a recommended cleaning method for each type, as indicated in Table 2.

A study of this refinery's above-recommended methods indicates that the principles may be used for either in-place or out-of-shell cleaning, with the exception of the use of water jets.

For out-of-shell cleaning of nonferrous bundles, one refinery prefers acid pickling for general use. The acid bath consists of 3,000 gal. of hot salt water and 800 gal. of 35° Be. sulfuric acid (i.e., a 10 per cent concentration of acid). Tube bundles are immersed in this bath for a period of 16 hours during which time the bath is kept at 150° F. by steam heat. Bundles are then washed with water to remove acid. On one test the interior of the tube bundles after immersion and wash showed 75 per cent bright metal exposed. It costs approximately $150 to clean a 400-sq.-ft. bundle by this method exclusive of removal cost.

Metal loss based on weighing two pieces of admiralty-metal tubing, one new and one used, indicated a metal loss of 0.0042 g. per sq. in. when immersed in the same acid as the bath for 24 hours at 160° F.

Some refineries have found crude sodium sulfonates effective as cleaning agents. With sulfonate detergents, in-place cleaning may be used. The emulsifying agent is effective in cleaning exchangers and other equipment which is fouled with oil, oily residues, or deposits composed of carbon or mineral matter bound by oil or oily residues. In general, the crude sulfonates are mixed in varying concentrations with water containing 2 or 3 per cent sodium carbonate and circulated through the equipment. (The crude sulfonates are produced as a byproduct from residual acid-oil remaining after heavy acid treatment of a coastal distillate phenol extract. The residual acid oil is neutralized with sodium hydroxide at 210° F. and the crude sulfonate composed of approximately equal parts of oil, water, and sulfonates are separated from the bulk of the oil by addition of 5-10 per cent of water.) The refineries feel that considerable savings are effected by the use of this method because it eliminates removing the tube bundle and the resultant down time.

In-place cleaning by the solution method has been tried but has not proven satisfactory in all cases. Before in-place cleaning is attempted it is necessary to have a thorough knowledge of the exact deposit to be

TABLE 2

Type of deposit—	Recommended cleaning procedure
Diolefin polymer on steel tube bundle	Contact with 90-98 per cent sulfuric acid in vat for 2 hours at 175°-200° F. Follow by cold-water wash.
Residuum or tar	Soak in circulating hydrocarbon solvent at elevated temperatures.
High carbon-low oil content	Soak in hot gas oil (6-8 hours), followed by 8 hours in 0.5 per cent water solution of Oakite railroad cleanser. Final removal by 175-psi. water jet.
Low carbon—high oil content on steel tube bundle	Soak in 98 per cent sulfuric acid at 150° F. followed by water wash. Finally soak in 0.5 per cent water solution of Oakite railroad cleanser.
Iron, sulfur, carbon deposits	Inhibited HCl followed by soaking in 0.5 per cent Oakite railroad cleanser at 210° F. for 12-18 hours.
Butyl rubber	Varsol (hydrocarbon solvent) at atmospheric pressure.
Water scales	Inhibited HCl at 100° F.-150° F. for 2-6 hours. Periodic addition of acid if necessary.

removed. A comparison of solution cleaning and mechanical cleaning would favor the solution method, assuming the solution employed was effective.

Scale deposits from cooling water are readily removed by in-place solution cleaning methods. Either an outside company or the refinery facilities may be employed. The method is to circulate inhibited HCl at about 150° through the tubes of the condenser or cooler. This is continued for from 2 to 6 hours, or until CO_2 evolution is small. After the acid treatment, water wash is employed.

During comedown of a plant, it is sometimes possible to accomplish partial cleaning by circulating a hot fluid having solvent action through the exchangers before they have cooled off and the deposits become dry.

Means of out-of-shell cleaning which employ hydraulic jets and controlled oxidation of the carbon deposits have not been completely investigated. One refinery reports that 300-400 psi. water jets do an excellent job of outside tube cleaning. The exchanger bundle is placed on a car and moved slowly on tracks past the high-pressure water jets. Another refinery has reported successful cleaning of a tube bundle covered with hard, thick coke. The bundle was moved into an oven, and the carbon successfully burned off. It is indicated that careful control of oxygen and burning rate will be necessary when the burning method is resorted to.

Sandblasting is a cleaning method which is finding increasing favor. It may be used to clean the inside of the tubes of an in-place bundle, or either side of the bundle when it is withdrawn from the shell. It is faster and more effective than the old method of washing with hose streams, punching, and drilling. A good sandblasting job on a badly fouled bundle will clean the unit so effectively that it will perform like new.

The nozzle is usually held from 2 to 14 in. from the object to be blasted. Experience indicates the proper "shooting distance." A sweeping rotary motion is generally employed until bright metal appears. In cleaning the internal surface of exchanger tubes, the nozzle is placed at the end of the tubes so that the bore of the nozzle is concentric with the inside diameter of the tube. Experience has shown that it is seldom necessary to blast from both ends of a bundle to remove all foreign matter. It is important that coke and carbonate-type scales be dry to prevent plugging. When a tube is plugged as sometimes happens, the sand can usually be removed by air pressure, punching with a rod, or, in rare cases, drilling. Weather conditions have little effect on operations, but it is mandatory that the abrasive be thoroughly dry and the object to be blasted reasonably dry.

An average of 100 ⅝-in. o.d. by 16 BWG by 144-in. tubes (on square pitch) can be cleaned by a two-man team in an hour. The length of a tube does not greatly influence cleaning time insofar as internal surface is concerned.

The abrasive recommended for optimum results in cleaning exchanger tubes, internally and externally, is a sharp, angular sand equal to washed Colorado River (Texas) sand which is screened through a ¼-in. mesh. All sand must be thoroughly dry to reduce the inherent tendency of the hose to plug. A gas-fired, rotary kiln drier may be used and the dry sand stored in hoppers for distribution. The practice of using reclaimed sand is not generally permitted due to the presence of carbonates, oxides, sulfides, oil and coke. Compressed air at about 100 psi. is used at the rate of 200 cu. ft. per minute per team.

Acknowledgment

The authors wish to express their appreciation of the cooperation of M. J. Lang and G. K. Simpson of Esso Standard Oil Co., Bayway refinery, who supplied the test data relative to fouling rates used in the paper.

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Fig. 1—Aerial view of the new McCarthy chemical plant—Winnie No. 1. Oxygen plant in left of picture, chemical processing unit in right, storage in foreground, and absorption plant at far right

Complete Gas Utilization Is Stressed by McCarthy's New Petrochemical Plant

by Leigh S. McCaslin, Jr.

THE first unit in a multimillion dollar petrochemical development by McCarthy Chemical Co. at Winnie, Tex., 25 miles southwest of Beaumont, has been completed.

Producing formaldehyde, acetaldehyde, and methanol from residue gas, the plant is particularly significant as it represents a fourth link in an important conservation chain. This chain is the processing and complete utilization of natural gas. In an integrated and closely coordinated operation, the McCarthy interests are efficiently utilizing this natural resource in the Beaumont-Port Arthur-Orange area. The four links in the chain are:

1. Production of gas.
2. Extraction of the conventional petroleum products.
3. Production of chemicals from the gas.
4. Distribution of the residue gas to a pipe-line system.

The new chemical plant, which will be known as Winnie No. 1, utilizes residue gas from McCarthy's 100,000-M.c.f.-per-day absorption plant, which is on adjacent acreage, as its basic raw material. By a direct oxidation process, portions of this dry gas are transformed to aldehydes and alcohols. In addition to residue gas, raw materials for the plant include lime from Austin, sulfuric acid from the Beaumont area, caustic from the Houston area.

The plant is the result of studies made in 1946 which showed that a plant producing oxygenated hydrocarbons would fit into the national economic picture and would be feasible from the viewpoint of raw materials and transportation facilities. A process was made available by Fomac Engineers to the newly formed McCarthy Chemical Co. for the plant and construction began in the summer of 1947. The process utilizes recent developments in petroleum chemistry and the technique of producing cheap oxygen from air.

Products of the plant are all classified as intermediate chemicals and will be shipped in tank-car lots to producers of finished chemical products. Two concentrations of formaldehyde are obtained. Much of the methanol produced in the plant is reprocessed and converted to formaldehyde of high concentration. This is blended with the primary product to the concentration desired by the customer.

Formaldehyde is used in the production of plastics, dyes, explosives, and various chemicals. Approximately 70 per cent of the formaldehyde manufactured today is used in the production of plastics, notably those of the phenolformaldehyde type. Methanol is itself used largely in the production of formaldehyde. Other uses are in the manufacture of other chemicals and as a low-cost antifreeze. Acetaldehyde finds its end use in the production of protective costings, plastics, paints, and chemical synthesis. To illustrate the volume of United States production of these chemicals, the estimated output for 1948 is: methanol, 125,000,000 gal.; formaldehyde, 500,000,000 lb.; and acetaldehyde, 300,000,000 lb.

Oxygen, which is required on a tonnage scale, is manufactured at the plant site from air. The installation is one of the largest of its type in the world and uses a modified Linde-Frankl cycle low-temperature process. Temperatures of about —300° F. are encountered in this process. The plant is an outgrowth of the small portable units developed during the war for furnishing oxygen for the Air Corps at remote bases. In addition to process advantages, the use of oxygen minimizes diluents in residue gas, thus permitting its further use as a fuel.

Since the plant is located in the so-called "hurricane belt," all equipment and structures are designed for

winds of 125 m.p.h. In the way of instruments, electronic temperature equipment is used throughout. Oxygen-analyzing instruments operate on a unique principle based on the fact that oxygen is one of the very few gases which is deflected by a magnetic field. Insulation in the plant represents some recent development work. It consists of two types—glass base and silver base.

There are a number of interesting sidelights concerning the operation of this latest McCarthy enterprise. Some of the formaldehyde product tanks in the plant are lined with a plastic material which is itself made from formaldehyde. Methanol, another product of the plant, will be used to treat residue gas during extreme cold weather to prevent freeze ups due to hydrate formation. Power for the layout is generated by Gulf States Utilities Co. using gas which has been through the McCarthy Winnie plants and transported to Beaumont through McCarthy pipe lines.

The foregoing description of the chemical plant covers the third link in the four-link chain of the McCarthy program for full utilization of natural gas. A description of the other three is necessary for a full picture of the operations at Winnie.

The gas and the distillate which are the raw materials for the absorption plant are produced at Stowell field in the vicinity of Winnie, and at Jackson Pasture field near Galveston Bay. Extensive exploration, which resulted in the discovery of these fields among others, was started by McCarthy in the early thirties. Well-head pressures in these fields are somewhat in excess of 1,000 psi. The fields represent Phase 1 in the four-phase setup of the McCarthy interests.

Phase 2, or the second link in the chain, is the processing of the gas and distillate in a conventional-type absorption plant. The first of two plants, which is known as absorption plant No. 1, has been in operation since November 1945. Products recovered from the gas and distillate are gasoline, butane, propane, kerosine, and fuel oil. Incorporated as an integral part of the absorption plant is a recently completed reforming unit built by Fish Engineering Corp. of Houston and based on a process licensed by Phillips Petroleum Co. This unit, utilizing a bauxite catalyst, reforms gasoline constituents to upgrade the gasoline to high-octane quality. When operating at full load, based on feed from absorption plant No. 1 and No. 2, this unit will produce sufficient stock for blending 5,000 bbl. per day of high-octane gasoline. The unit was placed on stream for acceptance runs in July of this year.

A second absorption plant, designated as No. 2, is now under construction and initial operation is scheduled early in 1949. This plant will process high-pressure gas and distillate from Jackson Pasture field. At present, gas is delivered through this line to supplement production in the Winnie area. The products of this plant are scheduled as follows: light gasoline, cycloversion feed-naphtha, propane, butane, kerosine, and fuel oil. The naphtha cut provides the bulk of the feed to the cycloversion unit of absorption plant No. 1. The product of this reforming operation is blended with the light gasoline to provide the finished premium-grade high-octane gasoline.

The third link in the four-phase gas processing operation is, of course, the production of chemicals as outlined earlier. The fourth and final phase is the distribution of the residue gas from the chemical plant to a pipeline system. It enters the distribution system of the Jefferson Pipe Line Co. at 800 psi. for ultimate consumption by commercial, industrial, and residential users in the Beaumont-Port Arthur-Orange area. The interrelated operations of the four-step processing of the gas are sufficiently flexible that gas sales can be made independent of plant operations. Of the gas which leaves the well head, 85 per cent ultimately enters the Jefferson pipe-line system.

The transportation facilities available to the plant are adequate. The plants are located on the Gulf, Colorado, & Santa Fe Railway. The intracoastal canal passes within 15 miles of the plant. Recently completed are the McCarthy terminal and dock facilities at Port Neches. Facilities are available here for handling and loading deep water tankers. Access to the intracoastal canal is available through the Neches River. Products will be transferred from the Winnie plants to the dock terminal through a 28-mile, 6-in. line by means of pumps. Present products under schedule for tanker and barge shipments from the dock terminal are gasoline, kerosine, and fuel oil. Plans are under consideration for the transfer of petroleum chemicals to this terminal for water transportation to the East. Present storage at the dock area is sufficient for 155,000 bbl. A fleet of 10,000-gal. glass-wool-insulated, plastic-lined tank cars are to be employed initially in moving chemical plant products.

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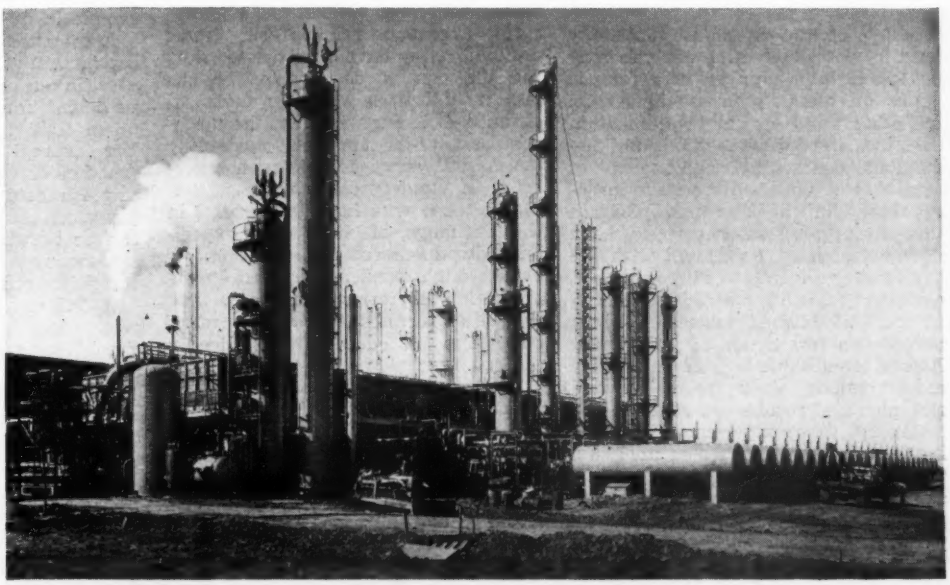

Fig. 2—Fractionating columns and rundown tanks of chemical plant. Structure right behind columns is cooling tower. There is working space underneath the cooling tower which is separated from it by a concrete floor. All instruments, gages, etc., at ground level are located in this space

Analysis of MINERAL WATERS

Part 1

by L. C. Case* and D. M. Riggin*

AN ever-increasing percentage of day-to-day problems in the oil-production industry is found to be due, either directly or indirectly, to water. Corrosion cannot take place in the absence of water, nor can emulsions form to complicate the business of pumping oil to the surface and into pipe lines, economically of course. Thus, in many cases the water, whether it be water vapor in gas or heavy salt water in oil, is entirely unwanted and endless efforts are made to prevent or minimize its effects.

Sometimes water is desirable and the problem may be to find a greater abundance and better quality. Quality may be unavoidably lacking and thus an unsuitable available supply must be adapted to a given purpose. Progress in secondary-recovery methods, particularly water-drive projects, has added greatly to the number and significance of water problems.

In view of the few reasons above outlined, and others too numerous to mention, it seems presently worth while to summarize the best existing methods for the laboratory examination of those waters which contribute to our oil-field problems, to discuss at least a portion of the interpretation and significance of results and, if possible, to clarify to some extent a certain degree of existing confusion pertaining to water-analysis nomenclature.

Many of the methods commonly used in water and brine analysis may be found in a number of reference books on quantitative methods. On the other hand, no single publication describes all of these methods and discussions concerning significance of results to be obtained are quite largely absent in the literature. Certain time-saving revisions have been made in some methods, coincident with the availability of improved equipment, and these revisions may be found only in the unpublished laboratory work books of a few major oil companies. Rather remarkable lack of uniformity exists among these methods, and statements of results are confusing to all except those experienced in making and interpreting water analyses. This situation is somewhat understandable when reference is made to published articles which, for example, use "parts per million" and "milligrams per liter" synonymously, as well as "reacting value," "equivalents per million" and "equivalents per liter."

*Gulf Oil Corp., Tulsa.

Twenty years or more have passed since publication of a commendable effort at a comprehensive treatise on brine-analysis methods. During this period the Gulf laboratory has received endless queries concerning water analyses, ranging from definition and calculation to interpretation and correlation. It has been noted that many questions come from capable engineers and chemists who should have no difficulty if statements of water analyses were more uniform in nature. It has been noted also that qualified chemists, uninitiated in the ways of water analysis, sometimes spend months of relatively unproductive work while gleaning essential details from portions of many references and from tedious laboratory experiments.

In contrast, those chemists or engineers who have had the opportunity to approach water problems as later outlined in this report have invariably become proficient in a few weeks' time. Many of these "students" have added measurably to this work merely by furnishing examples of logic and human reaction. Others have supplied specific suggestions which contributed to the gradual change and improvement of the manuscript. Erroneous and confusing terms are believed to have been deleted during the continued revision. Thanks are due all these men for their assistance. It is our wish that the methods and discussions on succeeding pages will serve all oil men interested in water problems and particularly those who have cooperated in the exchange of ideas and experience. In the event this work exerts even a slight tendency toward standardization of terms and statements, as well as furnishing a working manual, then its authors are deeply pleased.

Preliminary Treatment and Examination of Samples

Samples of brines as received at the laboratory commonly contain impurities such as oil and suspended clay. Usually a thick, qualitative filter paper will remove oil as well as clay which is always well flocculated in strong brine. If much oil or emulsion is present, it may be necessary in rare cases to use a centrifuge or separatory funnel. A quick and convenient method of oil separation is that of using a small siphon to obtain brine from underneath the oil layer, filtering the siphoned water if sediment is present.

Preparation of the samples should be completed as quickly as possible to avoid undue aeration or evaporation. Contact with air tends to precipitate dissolved iron and calcium carbonate. Similarly, the loss of CO_2 alters pH and alkalinity determinations. If the pH value is to be used, it should be determined immediately on a freshly filtered sample. Alkalinity should also be found without delay on a similar portion. If, during the alkalinity titration, the brine is found to have phenolphthalein alkalinity, then cement contamination is indicated. Similarly, if the sample is acid, it is strongly indicated that the sample is partially spent acid rather than "formation brine." Other contaminants from various sources may have diverse effects on the analysis or its final interpretation. Thus, any unusual characteristics which appear in the sample after original clarification should be checked before proceeding with the analysis.

Approximation of total dissolved solids by the specific-gravity method completes the preliminary examination. Dilution, from drilling water or other sources, may be checked in this manner before proceeding to more time-consuming details of the analysis.

Quality of the sample, as determined by the preliminary examination, should constitute a basis for acceptance or rejection by the analyst who, in turn, must base his decision on appreciable experience with similar samples and problems and, in addition, the particular purposes to be served by data concerning the sample in question.

A so-called "partial" analysis, stating quantities of principal anions and specific gravity, frequently may be sufficient for decision concerning a given field query of urgent nature. For example, such incomplete inspection or analysis may easily distinguish between drilling water and formation brine during a drill-stem test or between formation brine and extraneous water from above if characteristics are widely divergent.

It follows that the order of analysis, after preparation of sample, should logically be: alkalinity, specific gravity, chloride, and sulfate. The specific methods are given in this order, succeeded by details of methods for common metallic ions and less frequently determined constituents.

Determination of Alkalinity (OH, CO_3, HCO_3)

Reagents required:

1. H_2SO_4—0.05 N. (Standardize

against Na_2CO_3 using methyl orange indicator).

2. Na_2CO_3—Wash c.p. anhydrous Na_2CO_3 with ethyl alcohol and dry 1 hour at 110° C.

3. Phenolphthalein — Dissolve 5 g. per l. of 50 per cent ethanol.

4. Methyl orange—0.5 g. per l. of distilled water.

As stated previously, the alkalinity determination should be made as soon as possible after filtering the sample, to prevent possible loss of CO_2 and subsequent precipitation of the alkaline earth carbonates.

One hundred milliliters of the filtered sample is placed in a 250-ml. flask or beaker and 2 drops of phenolphthalein indicator solution added. Red coloration proves the presence of normal carbonate and/or hydroxide and in an oil field brine usually indicates cement contamination, the presence of which would upset the normal Ca-Mg ratio and render the water unfit for correlating purposes.

The solution is titrated with 0.05 N. H_2SO_4 until the coloration just disappears. The number of milliliters used corresponds to "P" of Table 1. Then, to the same solution, 2 drops of methyl orange indicator are added, and the titration carried to the end point, as shown by the indicator.

The total number of milliliters of acid used in both titrations corresponds to "T" in Table 1.

TABLE 1

Relationship Between Alkalinity to Phenolphthalein and Alkalinity to Methyl Orange in Presence of Hydroxide, Carbonate, and Bicarbonate

Result of titration—	Value of radical expressed in terms of ml. of 0.05 N. sulfuric acid		
	Hydroxide	Carbonate	Bicarbonate
P equals 0.0	0.0	0.0	T
P less than ½T	0.0	2P	T-2P
P equals ½T	0.0	2P	0
P greater than ½T	2P-T	2(T-P)	0
P equals T	T	0	0

One milliliter of 0.05 N. sulfuric acid is equivalent to 0.85 mg. of hydroxide, 1.5 mg. of carbonate, or 3.05 mg. of bicarbonate. Since 100 ml. of the original sample is used for titration, these values are multiplied by 10 to give the corresponding figures in terms of 1 l. of the original sample—namely, 8.5 mg. for hydroxide, 15 mg. for carbonate, and 30.5 mg. for bicarbonate. The latter values, when multiplied by the proper figures calculated according to Table 3, give the concentration in mg./l. for hydroxide (OH), carbonate (CO_3), and bicarbonate (HCO_3), respectively.

Examples, using 0.05N. acid and 100-ml. samples:

1. T = 2, P = 0, then: OH = 0; CO_3 = 0; HCO_3 = 30.5 × 2 or 61 mg./l.

2. T = 20, P = 5, then: OH = 0; CO_3 = 2 × 5 × 15 or 150 mg./l.; [20 — (2 × 5)] × 30.5 or 305 mg./l.

3. T = 10, P = 5, then: OH = 0; CO_3 = 2 × 5 × 15 or 150 mg./l.; HCO_3 = 0.

The most accurate method for determination of total solids is that of evaporating a measured quantity at 105° C. and weighing the residue. The flask should be tightly stoppered while cooling and weighing to avoid reabsorption of moisture. Determination of total solids by the drying method is rather common practice and commendable laboratory technique since it serves as a check on the accuracy of total solids by summation of all determined constituents.

A close approximation of total solids, however, may be obtained for mineral waters and brines above specific gravity 1.020 from the corrected specific gravity. Table 2[1] lists average total solids for equivalent specific gravities. This relationship varies appreciably with differences in major constituents. Therefore, more accurate tables or curves may be made for a given locality by using a number of analyses from the area or source in question.

TABLE 2—RELATIONSHIP BETWEEN SPECIFIC GRAVITY AND TOTAL SOLIDS

Sp. gravity of sample at 60° F.	Approx. total solids in mg./l.
1.020	27,500
1.030	41,400
1.040	55,400
1.050	69,400
1.060	83,700
1.070	98,400
1.080	113,200
1.090	128,300
1.100	143,500
1.110	159,500
1.120	175,800
1.130	192,400
1.140	210,000

The specific gravity of the filtered water is determined with a hydrometer if sufficient sample is available. Inadequate samples necessitate the use of a specific-gravity balance or pycnometer. The measurement is usually made at room temperature and the value so obtained is converted to the corresponding value at 60° F. as follows: add 0.001 to the specific gravity as taken for each 5° F. above 60° F. or subtract 0.001 for each 5° F. below this standard. For example, a water having a specific gravity of 1.025 at 78° F. would have a value of 1.029 at 60° F. and a value of 1.070 at 40° F. would become 1.066 at standard temperature.

Determination of Total Chloride

Reagents required:

1. $AgNO_3$—Approximately 0.15 N. (Standardize against NaCl solution).

2. NaCl—0.1410 N. 1 ml. = 5.00 mg./Cl.

3. K_2CrO_4—5 per cent solution. Dissolve 50 g. K_2CrO_4 in a little distilled water. Add $AgNO_3$ to produce a slight red precipitate. After standing overnight, filter and dilute to 1 l. with distilled water.

4. Carbon, decolorizing (Norite F. Q. P.) Eastman Kodak No. P-1731.

5. Hydrogen peroxide—30 per cent solution.

6. NaOH solution — Approximately 1 N.

7. H_2SO_4 solution — Approximately 1 N.

From the corrected specific gravity, the amount of sample to be used for analysis is determined by reference to Table 3.

TABLE 3

Sp. grav. @ 60° F.—	Aliquot for Cl, ml.	Factor
1.006 or below	100	10
1.006-1.015	10	100
1.015-1.045	5	200
1.045-1.090	2	500
1.090-1.140	1	1,000
1.140-	0.5	2,000

With reasonable care and clean equipment, an experienced analyst may pipette directly all aliquots down to and including 2 ml. With samples lower than 2 ml., a dilution should be made. When extreme accuracy is essential, other aliquots may be taken after dilution. For example, if the corrected specific gravity is 1.048, one may pipette 2 ml. directly or pipette 20 ml. into a 100-ml. volumetric flask and after diluting to the mark with distilled water and mixing well, take 10 ml. of the diluted sample, representing 2 ml. of the original, for analysis. The factor in Table 3 is used to convert the volume used for analysis to the equivalent of 1 l. of the original sample.

The aliquot chosen from Table 3 should be free from all suspended matter. The pH should be regulated with either dilute acid or dilute base until it falls between the limits indicated by methyl orange and phenolphthalein indicators. Sulfite or sulfide, if present, should be destroyed by adding a few drops of 30 per cent hydrogen peroxide. Color due to colored ions in solution is removed by precipitating the interfering ions with NaOH solution, filtering and neutralizing the filtrate with dilute acid before titrating. Color due to foreign organic material such as tannin is removed by contacting the solution with activated carbon and filtering before measuring the aliquot.

To the sample, prepared as above, are added several drops of 5 per cent potassium chromate solution and the sample is titrated with $AgNO_3$ having a factor of approximately 5 mg. of Cl per ml. of $AgNO_3$, until a color change from yellow to red is perceptible. Violent agitation should be avoided and the bulk of the sample kept small as the silver chromate formed at the end point is somewhat soluble and such treatment would naturally lead to high results.

mg./l. Cl = factor (Table 3) × titer × $AgNO_3$ strength (mg. Cl per ml. solution)

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Supercompressibility Factors Quickly Computed

by F. C. Walters

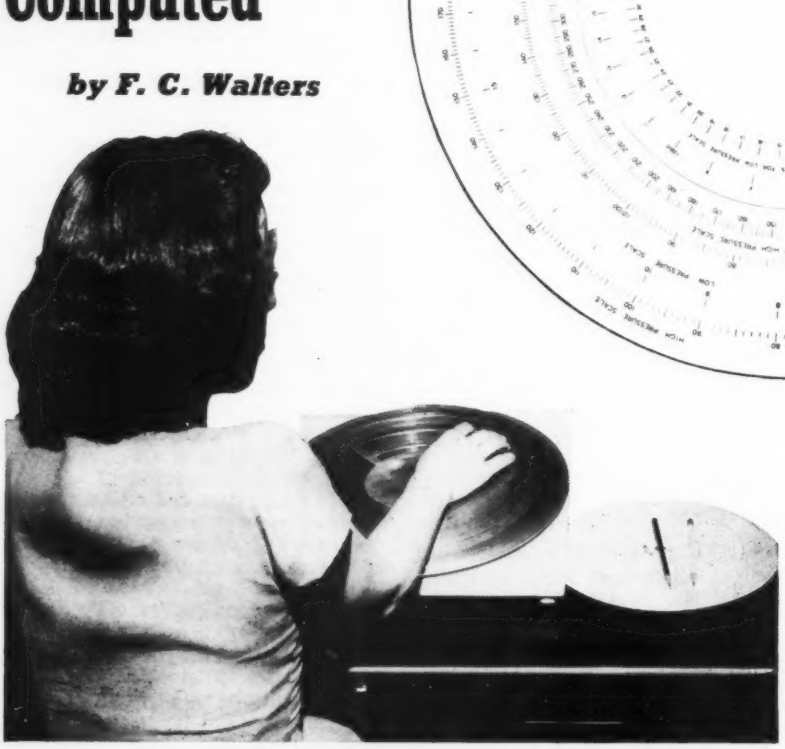

Fig. 1—Computer is readily adaptable to clerical interpretation

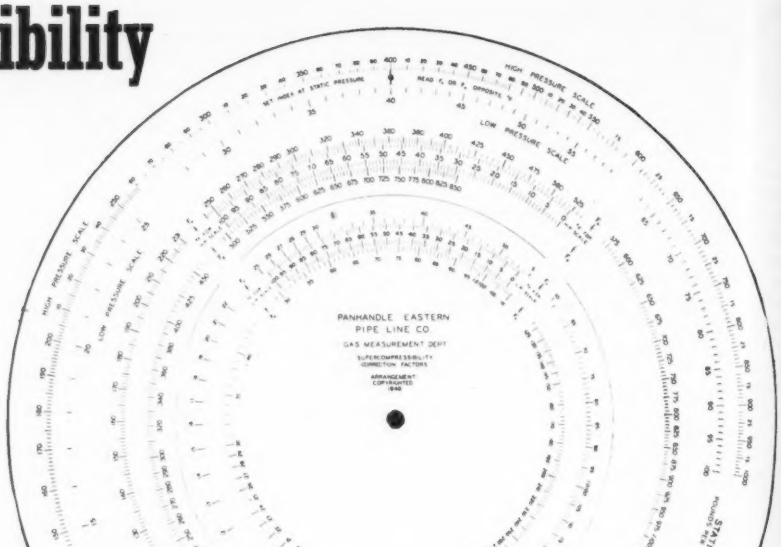

Fig. 2—Example of calibration

A native of Oklahoma, Fay C. Walters has been superintendent of transmission gas measurement for Panhandle Eastern Pipe Line Co. for over 17 years. Previously he was associated with Oklahoma Natural Gas Co. at Tulsa. He has served on the general and executive committees of the Southwestern Gas Measurement Short Course. He was graduated from the school of chemical engineering at University of Kansas.

PANHANDLE EASTERN PIPE LINE CO. has developed a circular computer (Fig. 1) for the direct reading of supercompressibility factors for natural gas. The computer will indicate with one setting the value of supercompressibility factors to the fourth place past the decimal for both displacement-meter and orifice-meter measurements. The first computer has been in use in Panhandle Eastern's gas-measurement office since early April of this year. The computer has been found to facilitate meter-chart calculation procedure since it eliminates the necessity of reading supercompressibility factors from curves or tables. It has also been found to be readily adaptable to clerical interpretation.

The computer is composed of three polished aluminum plates on which the scales are etched. The outer plate is an annular ring containing the pressure scales and is permanently fixed to a turntable so that the "read" pressure may be brought to proper eye level to facilitate reading. The inner plate, containing the supercompressibility factors, is circular and is also fixed to the turntable except that its position with respect to the pressure scales may be varied in order to calibrate the computer against periodic determinations. After calibrating, it can be fixed in position with the use of set screws provided on its underside. The top plate, containing the index and temperature scales, is a circular segment and rotates on its center. A tilted wooden base, 15 by 15 in., supports the turntable on which is mounted the computer. The diameter of the computer is 14 in. The combined weight of the instrument is 6 lb.

The computer is based on an empirical equation which is generally accepted in the standard practice of natural-gas companies. The development and application of the equation is set forth in the California Natural Gasoline Association Bulletin No. TS-354, dated 1936, and entitled "Tentative Standards for the Determination of Superexpansibility Factors in High - Pressure - Gas Measurements." The equation may be expressed as follows:

$$N = \frac{KP}{T^{3.835}}$$

where

N = Deviation from Boyle's Law—a decimal

K = A constant

P = Static pressure—psig.

T = Absolute temperature—° F.

In principle, the computer is a circular slide rule from which may be read directly the supercompressibility factors to be used in displacement and orifice meter calculations. Since the supercompressibility factor varies with the pressure and the temperature of a gas, the pressure, temperature, and supercompressibility-factor scales are incorporated on the computer.

To facilitate accurate reading, the computer incorporates two pressure scales, the low-pressure scale ranging from 5 to 100 psig. and the high-pressure scale ranging from 50 to 1,000 psig. The temperature scales range from 0° to 100° F. The supercompressibility factor for displacement meters is denoted as F_d and for orifice meters as F_o. To avoid crowding the notation on the supercompressibility factor scales, the scale notation is limited to the last significant figures of four places past the decimal point, except where the number of the significant figures changes from 1 to 2, 2 to 3, etc. At these points the entire factor is shown in slanted figures.

Since the value of the constant "K" in the above equation varies with the composition of the gas, the computer can be calibrated by setting known temperature and pressure conditions against the value of the supercompressibility factor determined at those conditions and by locking in place (in the proper position) the circular section of the computer on which is shown the correction factors.

Example of Calibration—Fig. 2

From a test, the deviation from Boyle's Law is 0.0672 at a pressure of 400 psig. and a gas temperature of 60° F. Since F_d is equal to (1+N), its value is equal to 1.0672 at the above temperature and pressure conditions. Therefore, to calibrate the computer, the index is set at 400 psi. on the high-pressure scale and the segment on which is shown the supercompressibility factor scales is rotated so that the value 1.0672 (F_d) on the scale marked "Correction Facctors for High-Pressure Scale" is in line with 60 on the scale marked "° F for H.P. Scale." The segment on which is shown the supercompressibility-factor scales is then locked in position by means of set screws. The temperature scale then becomes the only moving part of the computer.

Following a calibration of the computer, it is then necessary only to set the index at the required gas pressure and to read the supercompressibility factor F_d or F_o opposite the applicable gas temperature on the proper scale.

The calibration of a computer will depend upon the frequency of supercompressibility tests. Some companies use average values as long as such values remain within a set tolerance. Others carry out periodic tests or determinations and apply such results during interim periods. Upon consideration of general operating practices, it is evident that calibration of the computer in most instances will be fairly infrequent. Where factors must be applied in routine operations to gases of different characteristics, the recalibration of one computer for each group of meter charts would be feasible if not required too frequently. The computer has been arranged so that calibration is a simple and fast operation taking only a few minutes to perform. In some instances, however, it might be desirable to calibrate and assign an individual computer for the handling of each group of charts.

The computer has been copyrighted by Panhandle Eastern Pipe Line Co. and arrangements are being made for its manufacture.

BOOKS

A.S.T.M. STANDARDS ON COPPER AND COPPER ALLOYS. Published by American Society for testing materials, 1916 Race Street, Philadelphia. 504 pp. $4.35.

This publication includes the 106 standard specifications, test methods, definitions of terms, etc., covering copper and copper-base alloy products, which were developed by Committee B-5.

FRANK W WHEATLEY

Feature of the Week

May All of US Wish All of YOU

A Merry Christmas

And a Prosperous New Year!

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THE OIL AND GAS JOURNAL

"Okay, I'll start her up—but personally, I'd go to a regular dentist"

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Composition of Gasolines

Can you compare for us, please, the chemical composition of gasolines?—P. M. C.

FIG. 1, the triangular coordinate diagram on this page, somewhat answers your question. The three types of saturated hydrocarbons, i.e., normal paraffins, isoparaffins, and naphthene or cyclic, are considered as a single group. This is satisfactory from the standpoint of chemical reactivity of these hydrocarbons, but it is somewhat unsatisfactory from the standpoint of octane number or detonation quality because the normal paraffins have poor octane numbers whereas the naphthenes and particularly the isoparaffins have high octane numbers. Thus, Fig. 1 indicates little difference in composition between catalytic and thermal cracked gasolines, whereas from the standpoint of octane number the catalytic gasolines are excellent probably because of high percentages of isoparaffinic and naphthenic hydrocarbons. Although aromatic hydrocarbons have excellent octane numbers, these hydrocarbons are present in somewhat small amounts in all gasolines and hence their effect on the octane number of gasolines is not of great significance. No entirely satisfactory method of showing the chemical analyses of gasoline is possible because at least five different types of hydrocarbons are present, and because composition varies widely with the boiling-range being considered. Many of the data shown in Fig. 1 were taken from Sachanan, "The Chemical Composition of Petroleum," Reinhold Publishing Corp.

Flash Point of Stripped Absorber Oil

What is the range of flash point of the stripped absorption oil of gasoline plants? Can flash point be used to control the stripping?—W. B. H.

ALTHOUGH flash point, vapor pressure, and degree of stripping are intimately related, it is feared that the flash temperature for many stripped oils would be too low for control purposes. However, if flash point could be used it would be an excellent control test because of its simplicity and because it is extremely sensitive. Perhaps in certain plants which maintain a very low gasoline content in the stripped oil and particularly if the lean oil is high boiling, the flash test could be used. However, even in such plants it would seem that the flash temperature would be 40°-60° F., thus requiring refrigeration of the sample and the development of a special procedure for maintaining the right rate of temperature rise up to room temperature. No experimental data on the relation of vapor pressure or oil saturation to flash point are available to this department.

Ordinarily flash occurs for wide-boiling materials at a temperature at which the vapor pressure is about 1 ml. *(The Oil and Gas Journal, September 1, 1938, p. 42).* The relationship between flash point and vapor pressure is not a definite one, but for a particular oil and particular operation it should be definite enough for control purposes.

According to Boyd & Jones (Pet. Engineer, Sept. 1930, p. 40) the absorption oil should not exceed 5 mm. but it is thought that modern plants strip to vapor pressures of about 1 mm. The relationship between stripping factor and vapor pressure (80° F.) is somewhat as shown in Table 1. *(G. M. Liljenstein, Simplified Absorption Control Cuts Natural Gasoline Loss, The Oil and Gas Journal, January 27, 1938, p. 180):*

TABLE 1—RELATION OF STRIPPING FACTOR TO VAPOR PRESSURE

Stripping factor* of isopentane	Vapor pressure, mm. at 80° F.
1.4	2.15
1.6	1.49
1.8	1.16
2.0	0.93
2.2	0.78
2.4	0.69
2.6	0.61
2.8	0.56
3.0	0.52

*Petroleum Refinery Engineering, 2nd Ed., page 559, McGraw-Hill Book Co., N. Y.

Although the author of this page feels that the range of stripping factors shown in Table 1 are typical of today's operations (or even higher factors), the vapor-pressure data of Crippen and Laird (Vapor Pressure of Lean Absorption Oil, Proceedings Cal. Nat. Gaso. Assoc., Vol. 2, Feb. 1930) shown in Table 2 appear to indicate vapor pressures far higher than 1 mm. Table 2 may also be used to estimate the effect of temperature on vapor pressure.

TABLE 2—APPROXIMATE VAPOR PRESSURE CURVES OF FOUR LEAN OILS OF DIFFERENT VAPOR PRESSURE

Temp. (°F.)	Vapor press., mm. Hg. Oil 1	Oil 2	Oil 3	Oil 4
70	4.2	15.1	13.8	50
90	5.6	17.5	17.0	63
100	6.5	18.9	18.9	70
110	7.5	20.3	21.3	78
130	10.0	23.8	27.0	95
150	13.3	27.5	34.5	113
170	17.5	32.0	44.0	...

If the four stripped oils of Table 2 are typical, then only oil No. 1 could be tested conveniently by the flash point because the others would have flash points below 0° F.

Generally, it would seem that the flash point of most stripped oils would be too low for easy testing.

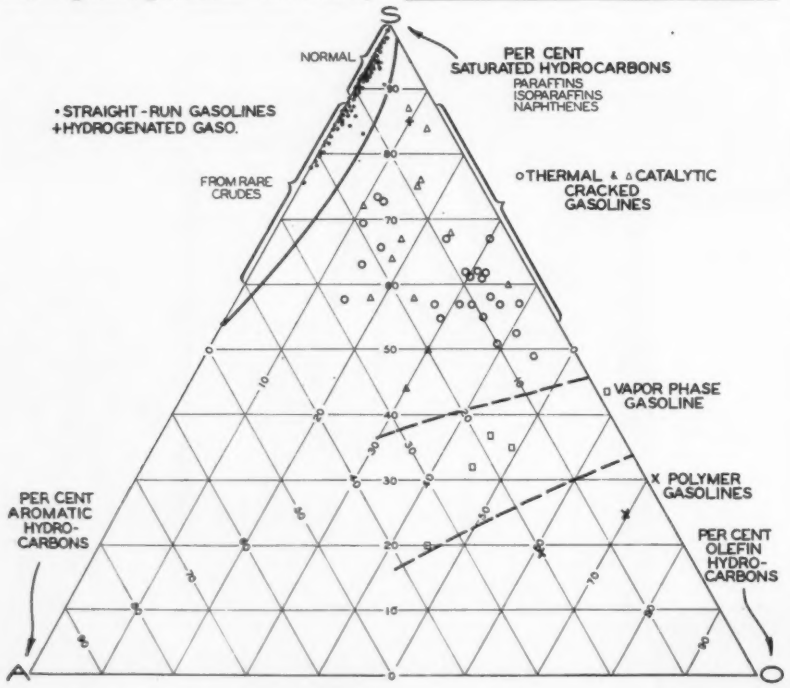


Fig. 1—Approximate chemical composition of gasoline in weight per cent

ENGINEERING *fundamentals*

Use of K_g/K_o Ratio

THERE has appeared in the literature[1,2,3] within recent years a development of theory whereby the relative permeability ratio, k_g/k_o, can be used as a basis for establishing working engineering relationships for gas drive. The per cent discussion will be a review of those theoretical considerations.

Let S_o designate the fractional reservoir oil saturation at any time. The stock-tank oil per unit of pore volume is then S_o/β, and the cumulative oil produced per unit of pore volume between times t_1 and t_2 will be:

$$C = \left(\frac{S_o}{\beta}\right)_1 - \left(\frac{S_o}{\beta}\right)_2 \quad (1)$$

Over a considerable region of fluid saturation, the relative permeability ratio can be expressed analytically as:

$$k_g/k_o = ae^{-bS_o} \quad (2)$$

This represents the typical straight line relationship on semilog paper (Engineering Fundamental No. 320). Solving this expression for oil saturation gives:

$$S_o = \frac{\log a - \log k_g/k_o}{b} \quad (3)$$

Substituting for S_o in Equation 1 gives the following equation for cumulative oil:

$$C = \left(\frac{\log a - \log k_g/k_o}{b\beta}\right)_1 - \left(\frac{\log a - \log k_g/k_o}{b\beta}\right)_2 \quad (4)$$

which is a general expression which applies to the cumulative oil produced by gas drive over an interval with no limiting assumptions excepting the validity of Equation 2.

An expression for k_g/k_o can also be obtained from the producing gas-oil ratio equation (Engineering Fundamentals No. 340). This is:

$$k_g/k_o = (R - r)\,\mu_g/\mu_o\,v/\beta \quad (5)$$

Substituting this into Equation 4 yields the following:

$$C = \left(\frac{\log a - \log (R-r)\,\mu_g/\mu_o\,v/\beta}{b\beta}\right)_1 - \left(\frac{\log a - \log (R-r)\,\mu_g/\mu_o\,v/\beta}{b\beta}\right)_2 \quad (6)$$

which is again a general expression for cumulative subject only to the limitations which apply to Equations 2 and 5.

It is interesting to note from Equation 6 the relationdship between cumulative oil produced during any fixed pressure interval and the gas-oil-ratio charge during the interval. A plot of these variables should be linear on semilog paper after shifting by an amount r. This is evident because fixed initial and final pressures and a fixed initial gas-oil ratio reduces the equation to:

$$\log (R-r) = \text{a constant} + (b\beta C)_2 \quad (7)$$

where the subscript 2 indicates conditions at time 2. For example, consider the case where the pressure is P, and the ratio is 2,000. At the pressure P: r = 700; β = 1.37; v = 0.0012; μ_g/μ_o = 0.020. For this reservoir, a = 977 and b = 17.7. At a new pressure P′, the values of physical constants will be β = 1.33; r = 550; μ_g/μ_o = 0.0167. The cumulative oil which will be produced during the pressure interval P to P′ will be a function of the value R which exists at P′. The variation is calculated and plotted in Fig. 1 as C versus log (R — r).

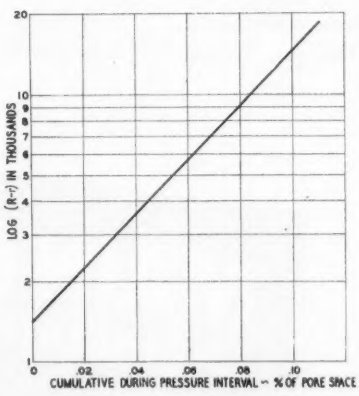


Fig. 1—Variation between gas-oil ratio at end of pressure interval and cumulative produced during interval for gas drive

Since the relationship shown is linear, a calculation of only one C and (R — r) value will be necessary. The slope of the line is $(b\beta)_2$, and since b is fixed, a known pressure P′ fixes β_2 and consequently the slope of the line. It should be noted that the units of the scale on this diagram are in per cent of pore space.

In the event that gas-oil-ratio values would be high enough that gas in solution could be neglected, the value of log R would plot as a straight line in place of log (R — r).

Nomenclature

S_o = fractional reservoir oil saturation
β = formation volume factor
C = cumulative stock-tank oil per unit of pore space
k_g/k_o = relative permeability ratio, gas to oil, at S_o
R = instantaneous produced gas-oil ratio
r = gas in solution
μ_g = reservoir gas viscosity
μ_o = reservoir oil viscosity
v = gas conversion factor, bbl. reservoir space per standard cubic foot
a and b are constants in Equation 2 and are dependent upon the porous media and the fluids involved
Subscripts 1 and 2 denote times 1 and 2 when reservoir pressure is P and P′, respectively.

References

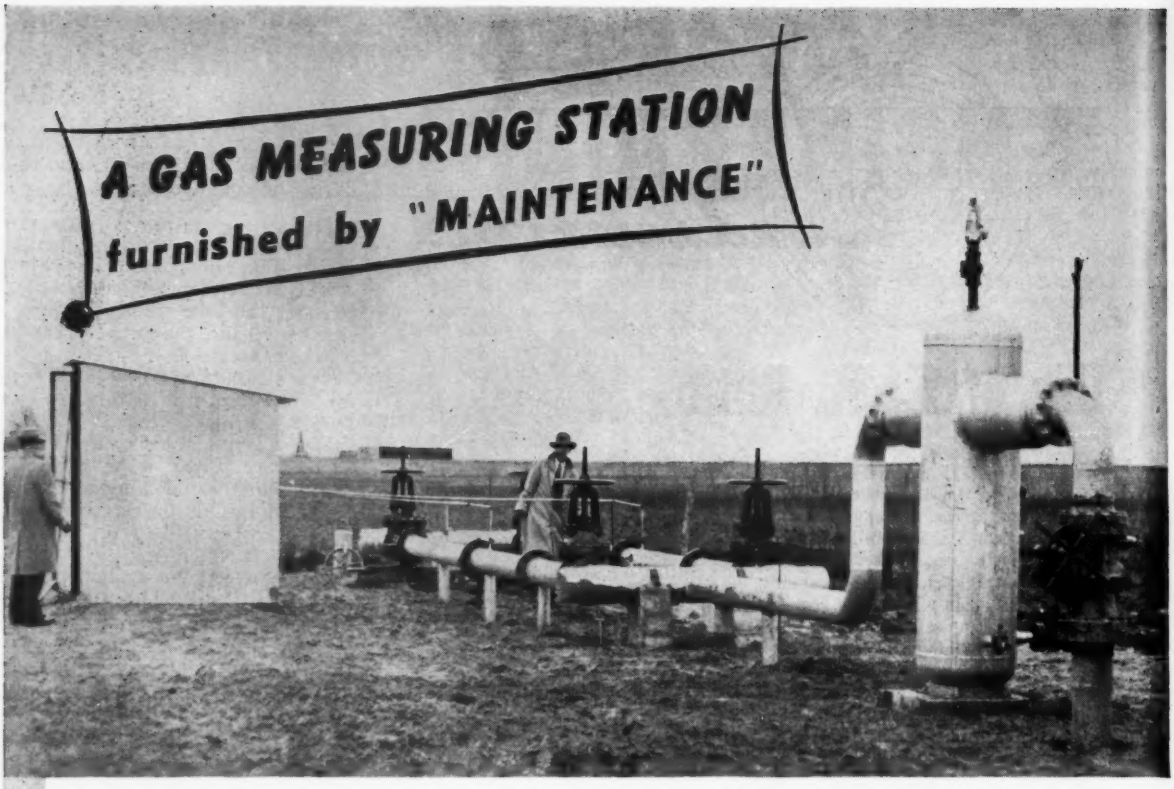
1. Predictions of Behavior in Air Gas Drive, Day and Yuster, Bulletin No. 41, The Pennsylvania State College, Mineral Industries Expt. Station.

2. Gas Requirements in Gas Drive Recovery, Yuster and Day, The Producer's Monthly, Oct. 1946, Vol. 10, No. 12.

3. A Note on Repressuring, M. Muskat, Producer's Monthly, Feb. 1946, Vol. 10, No. 4.

Series by Dr. John C. Calhoun, Jr., Chairman, Petroleum Engineering School, University of Oklahoma

A GAS MEASURING STATION furnished by "MAINTENANCE"



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MECO

Cost-imating

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Special Vessels

COST INDEXES, 1946 = 100

See Cost-imating Nos. 1 and 5 of October 21 and November 5, 1948, for complete indexes.

Year	Vessel or tank* steel	Vessel or tank† M & L	Refinery labor
1929	78	78	59
1939	85	80	68
1940	85	80	69
1941	85	81	71
1945	89	91	94
1946	100	100	100
1947	117	117	119
1948 (est.)	150	150	154

*U. S. Department of Commerce—Stat. Abstracts of the U.S. 1947, and Survey of Current Business.

†Based on Tank Steel index and 30 per cent of labor from Refinery Labor index.

Example.—The weights of vessel shells and heads were given in Table 3 of Cost-imating No. 9 of December 16, and the costs of steel, field erection, and various connections in other tables.

Consider a 10-ft. diameter carbon-steel vessel that is ½ in. thick and 32 ft. long between heads. It has ⅝-in. dished heads and is equipped with the following connections or openings:

4—¾-in. thermocouple couplings.
2—1½-in. couplings.
2—18-in. manholes, 300 lb.
1—30-in. manhole, 300 lb.
1—10-in. flanged nozzle.
4—4-in. flanged nozzles.
3—2-in. flanged nozzles.

The summarized cost estimate is shown in Table 1.

TABLE 2
Approximate Cost of Erection and Fabrication of Special Alloy and Steel Vessels*
(Cents per pound—1946)

Weight (lb.)	Clad steels	Stainless steels (No. 304 or 316)	Monel, nickel or inconel
10,000	47	53	57
25,000	31	35	38
50,000	23	26	28
75,000	19	21	23
100,000	18	20	21
150,000	16	18	19

*Based mainly on Lyle E. Fox[1] data which show erection and fabrication costs of clad steels are 220-230 per cent of the erection and fabrication of plain steel tanks. Likewise, the percentage for stainless steels is 250, and for nickel alloys is 265-275 per cent. Converted from 1947 by an index of 119.

TABLE 3
Approximate Base Costs of Special Alloys and Clad Steels (1946)

	Weight relative to steel	Cents per lb.
Clad steels:		
Nickel	1.02	*29
Inconel	1.015	*41
Monel	1.02	*40
304 stainless	1.00	†24
316 stainless	1.00	†29
347 stainless	1.00	†27
410 stainless	1.00	†22
430 stainless	1.00	†22
Alloys and steels:		
304 stainless	1.01	*33
316 stainless	1.01	*50
Monel metal	1.11	*42
Inconel	1.08	*63
Nickel	1.12	*53
Aluminum[3]	0.35	1.25

*Lyle E. Fox[1] prices reduced to 1946 by an index of 117. These prices include 20 per cent for waste and extras.

†Lukens Steel Co. prices May 21, 1946, for 10 per cent clad, raised by about 20 per cent for wastage and extras. Add about 20 per cent more and 20 per cent clad plate.

TABLE 4—LININGS, ETC., FOR VESSELS CONVERTED TO 1946

	Unit	M	L	M & L
Alloy linings for shell[2 3] (Type 410),* 5/64-in.	$/sq. ft.			5.40-8.00
Alloy linings for shell[2 3] (Type 410),* 7/64-in.	$/sq. ft.			5.80-8.40
Alloy linings for nozzles,[2 3] 5/64-in. lining[2]	c/sq. in.			23
Alloy linings for nozzles,[2 3] 5/64-in. facing[2]	c/sq. in.			34
Alloy linings for nozzles,[2 3] 5/64-in. cover[2]	c/sq. in.			27
Gunite,[4] shell	c/sq. ft.			47
Gunite,[4] structural members	c/sq. ft.			51
Metallizing, complete,[5] aluminum	$/sq. ft.	.39	.62	1.01
Metallizing, complete,[5] lead	$/sq. ft.			94
Metallizing, complete,[5] 18-8 stainless	$/sq. ft.			1.90-3.00
Metallizing, complete,[5] small jobs	$/sq. ft.			1.50

*Kind of alloy is not significant because labor is the main cost.

TABLE 1—COST ESTIMATE OF A VESSEL

Item		1946 costs L	1946 costs M & L	1948 costs* M & L
1—Shell, 32 x 641	20,510 lb.			
2—Heads, ⅝-in.	4,847			
	25,357 lb. @ 13c/lb.		$3,290	$4,940
4—¾-in. couplings @ 2.35			9	13
2—1½-in. couplings @ 3.60			7	11
2—18-in. manholes @ about 300			600	900
1—30-in. manhole @ about 665			665	996
1—10-in. nozzle @ about 105			105	157
4—4-in. nozzles @ about 39			156	234
3—2-in. nozzles @ about 23			69	103
1—Erection @ about 850 (job)		850	850	1,310
1—Freight on 15 tons for 640 mi. @ 2.5c (job)			240	360
			$5,991	$9,024
1—Stress relieving, if required @ 1 per cent (job)			60	90
1—X-ray inspection, if required @ 3 per cent (job)			180	271
Approximate cost			$6,231	$9,385

*1948 estimated cost based on a material index of 150 and labor 154; and allowing nothing extra for immediate delivery.

References

1. Fox, Lyle E., Chem. Engineering, Aug. 1947, p. 100.

2. Fowler & Brown, Pet. Engineer, Ref. Annual, 1943, p. 190.

3. Bliss, H., Chem. Engineering, May 1947, p. 126.

4. Newcomb, Kelly & Dixon, Pet. Refiner, Nov. 1942, p. 113.

5. Refiner, Natl. Gaso. Mfr., May 1939, p. 203.

No. 10 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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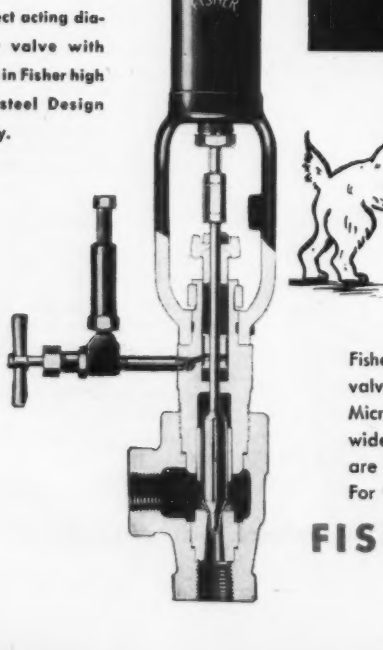

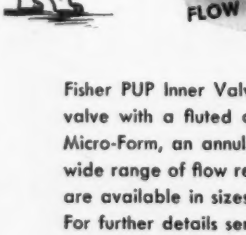

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FISHER GOVERNOR COMPANY

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PIPE LINES

Imperial Prepares for 450-Mile, 16-In. Line

Imperial Pipe Line Co., Ltd., has recently procured a mosaic strip map for the 450-mile, 16-in., Nisku, Alta.-Regina, Sask., crude-oil line scheduled for completion in 1950 in western Canada at a cost of $35,000,000. This map was prepared by Photographic Survey Co. from 400 vertical air photographs taken over a 466-mile route, 3 miles wide with a scale of 1 mile : 1 in. Photographing was done by a fleet of planes in 3 hours flying time. The mosaic strip was rephotographed to provide handy sectional sheets.

Now that Imperial is definitely in the drafting stage for this project which would have a maximum capacity of 100,000 bbl. daily, it has been mentioned in reports published at Toronto that the company is already considering later extensions of the pipe-line system from Regina to northern United States, Manitoba and Ontario. It has also been disclosed that Imperial is giving consideration to the possibility of a pipe line to move Alberta crude oil to the Pacific Coast. Such a Pacific Coast project would depend on success in determining further reserves.

At a recent meeting of the Canadian Club, Toronto, Henry H. Hewetson, president, Imperial Oil, Ltd., mentioned that there is a good market for refined products in the Dakotas of the United States but there are no refining facilities there. Under prevailing conditions he spoke of 2 years being a short time to build a sizable refinery. This situation as well as the other economic factors must be taken into account before embarking on such venture.

Tennessee Gas Is Authorized More Lines

Tennessee Gas Transmission Co., Houston, Tex., has received Federal Power Commission authorization to construct additional facilities for the specific purpose of transporting 111,000,000 cu. ft. of gas per day for the account of Manufacturers Light & Heat Co., Pittsburgh, Pa., from the Southwest to the Appalachian area.

Approval was granted for the construction of approximately 516 miles of main-line loops along the company's existing system, 85 miles of lateral line, and additional compressor facilities. Over-all cost of the authorized facilities is estimated at $49,569,391. The commission deferred authorization of a proposed 238-mile line extending from northeastern Kentucky into northern Ohio pending further hearing January 5, 1949, on other facilities proposed by Tennessee Gas.

The Tennessee Gas over-all program involves extension of its existing system by construction of approximately 395 miles of 26-in. main line from northeastern Kentucky to the vicinity of Buffalo, N. Y.; construction of about 909 miles of second and third loops along the existing main line in Texas, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and West Virginia; and additional compressor units. Estimated cost of the entire project, which would increase capacity of the Tennessee system by 340,000,000 cu. ft. daily, is $122,905,000.

In deferring action on the Kentucky-Ohio line proposal, FPC pointed out that after completion of the newly-authorized facilities, the Tennessee company would be able to transport the 111,000,000 cu. ft. of gas from the Southwest to the Appalachian area without using the Kentucky-Ohio line.

Southern Natural's Loop Laid Over Rocky Terrain

Southern Natural Gas Co.'s 35-mile, 24-in. loop near Birmingham, Ala., was completed early this month by H. C. Price Co. The route was entirely across rocky, mountainous terrain which required the use of 800,000 lb. of dynamite. There was an average of 80 bends and 382 wrinkles per mile.

In spite of the fact that the job was done over a period during which more rain fell than at any time in 20 years, it was completed on schedule. Contractor's operations were supervised by W. B. Williams from the Bessemer, Ala., field office.

Chicago Line Stock to Be Bought by Peoples' Gas

Acquisition of all outstanding stock of Natural Gas Pipe Line Co. of America and Texoma Natural Gas Co. by Peoples' Gas Light & Coke Co., Chicago, has been authorized by the Illinois Commerce Commission.

The Chicago utility, which owns 27.4 per cent of the stock in Natural Gas Pipe Line and 21.3 per cent of Texoma, proposes to pay $32,668,000 for the outstanding stock.

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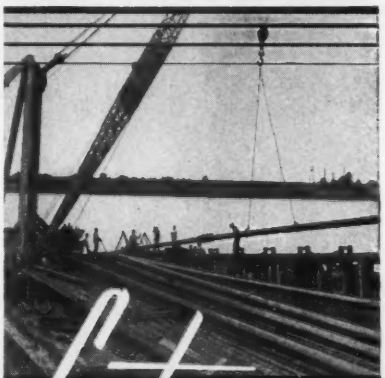

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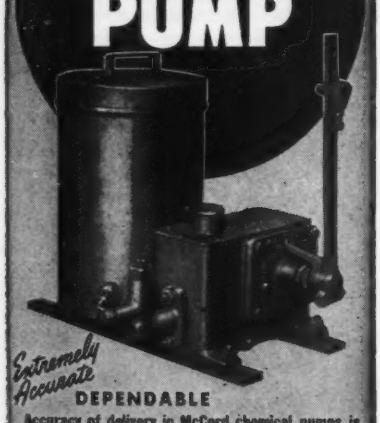

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America operates dual pipe lines from Texas gas fields to Chicago. Texoma, a producer of natural gas, with leases on about 132,000 acres, supplies Natural Gas company with more than 50 per cent of its needs.

Peoples' Gas Light & Coke Co. officials said that acquisition of the two firms would assure Chicago of an increasing amount of gas for at least 30 years.

FPC Denies Rehearing on Panhandle's Winter Rules

A petition for rehearing emergency service rules and regulations for natural gas service by Panhandle Eastern Pipe Line Co. to its customers, filed by Illinois Power Co., Decatur, Ill., has been denied by Federal Power Commission. The rules, which governed Panhandle's deliveries last winter, were recently ordered into effect by FPC for the coming winter.

Hearings on the emergency service rules were held October 21 at which time Panhandle and its customers were given opportunity to show cause why FPC should not establish the previous winter's rules for the coming winter. No objection was made. FPC states that Illinois Power's petition "does not state any reason or good cause, either for reopening the proceedings or granting rehearing..."

Southern Counties Gas Co. Is Seeking 35-Mile Line

Southern Counties Gas Co., Los Angeles, Calif., has requested Federal Power Commission authority to construct 35 miles of a 16-in. natural-gas line in Riverside County, California. The line would be a part of the 85-mile line to connect with the existing Texas-to-California pipe line near Moreno, Calif., and would extend to San Diego. Estimated cost is $1,931,700.

San Diego Gas & Electric Co. would construct the other 50 miles of the proposed line which would be located in San Diego County. The entire line is designed to increase Southern Counties' natural-gas deliveries to the San Diego company by 40,000,000 cu. ft. daily.

Circumstances of Fire at Seymour Station Explained

Conditions existing at the time of the fire and blasts at Texas Eastern Transmission Corp.'s station No. 14, near Seymour, Ind., November 19, have been explained in a report prepared by B. D. Goodrich, chief engineer of the company, which shows that work of restoring the system to partial service was completed by noon November 20 in 18 hours. Throughput was gradually built up to a performance of 400,000,000 cu. ft. daily by 5 a.m., November 21.

Although several persons working at the station were hospitalized briefly, there were no serious injuries.

In reconstructing events which occurred, it appears that shortly before 6 p.m., November 19 an 18-in. gate valve on the discharge line from the 24-in. station failed. The valve bonnet separated in its casting above the fillet of the bonnet flange. The flange remained bolted to the body of the valve and all bolts were intact after the separation.

The bonnet was thrown 300 ft. away. Apparently as the valve started its upward flight a spark was created which set off the fire. This spark may have occurred either by a blow from the valve disk striking the valve body or by the valve bonnet striking an overhead line.

Fire enveloped the "crude oil pump house" almost immediately after being ignited and the "products pump house" whose nearest point was approximately 180 ft. northeast of the valve location caught fire approximately 15 minutes later. The wind blowing the flames over this building contributed to igniting this building and several smaller structures between the two major "pump houses."

At approximately 7 p.m. a second blast occurred within the 20-in. pump house on the discharge valve of the No. 1 unit which resulted in the expansion of the grease within this valve under the high temperatures created by the fire, forcing a separation of the bonnet from the body and blowing the bonnet about 30 ft. away.

To prevent gas feeding through the break, the valve was closed at station 15, Batesville, Ind., 41 miles east; and the valve 15½ miles west of the station was closed. Extreme heat and flames prevented the closing of header valves at the station.

Major electric motors and compressors will require rebuilding. Transformers, scrubbers, and some of the major piping in the yard do not appear to be badly damaged. Auxiliary equipment for compressors was badly damaged and it is doubtful if any of this except low pressure equipment can be reused. In general equipment within the building and the buildings themselves were so bady damaged that it is unlikely that they can be reused without considerable reconstruction.

Subsequent to the fire at Station 14, gas throughput was increased at various sections to effect deliveries of 400,000,000 cu. ft. daily east of station No. 13 and deliveries of 410,000,000 cu. ft. west of that station. This compares with 418,000,000 cu. ft. throughput on November 18, the day before the fire.

East of Station 13, the system capacity of 420,000,000 cu. ft. of December 6 is being increased later in the month to 430,000,000 cu. ft. As Station 14 is reinstated, capacity will gradually build up to design capacity of 508,000,000 cu. ft. by February 1, 1949.

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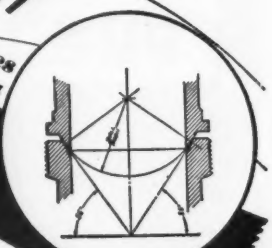

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NAME	Description	Use
Du Pont Gasoline Antioxidant No. 5	A solution of normal butyl-para-aminophenol in alcohols.	For improving the storage stability of gasoline.
Du Pont Gasoline Antioxidant No. 6	A solution of isobutyl-para-aminophenol in alcohols.	For improving the storage stability of gasoline.
Du Pont Gasoline Antioxidant No. 22	A commercial grade of N,N'-disecondary-butyl-para-phenylenediamine.	For improving the storage stability of gasoline.
Gasoline Dyes	Du Pont Oil Orange Du Pont Oil Red Du Pont Oil Yellow N Du Pont Oil Blue	For color identification of gasolines.
Du Pont Metal Deactivator	An 80% solution of N,N'-disalicylidene-1,2 diamino-propane in xylene.	To improve the storage stability of petrolum distillates containing dissolved copper.
Du Pont Rust Preventive No. 1	A viscous, reddish-brown clear liquid, readily soluble in mineral oil at room temperatures.	For use in petroleum bases to impart non-staining rust preventing properties.
"Ortholeum" 153	Fluorescent green liquid.	For use in motor oils and other lubricants to improve wear characteristics under conditions of boundary lubrication.
"Ortholeum" 202	A sulfurized terpene containing approximately 34% sulfur of controlled activity.	For use as a bearing corrosion inhibitor in detergent type oils. Sulfur activity also suggests usefulness as additive for cutting oils and hypoid lubricants.
Du Pont Phenyl-alpha-naphthylamine	Crystalline solid.	Oxidation inhibitor for various petroleum products.
Du Pont Phenyl-beta-naphthylamine	Powder.	Oxidation inhibitor for various petroleum products.
Du Pont Tributyl Phosphite	Water-white liquid.	For use in oils as a mild antioxidant and as a wear reducing agent.
Du Pont Tetraethyl Lead Compound—Motor Mix	Yellow liquid antiknock compound the principal component of which is tetraethyl lead.	For use as an antiknock agent in motor gasolines.
Du Pont Tetraethyl Lead Compound—Aviation Mix	A blue liquid antiknock compound the principal component of which is tetraethyl lead.	For use as antiknock agent in aviation gasolines.
Du Pont Fuel Oil Stabilizer No. 1	A blend comprising an antioxidant and metal deactivators in isopropanol.	Added to cracked furnace and diesel oils to improve storage stability.

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- *Gasoline Dyes*
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REFINING

Synthetic-Acetylene Gas Described by Dr. Schoch

A new process for the manufacture of synthetic-acetylene gas from natural gas was described last week to the southwest regional meeting of the American Chemical Society in Shreveport, La., by Dr. Eugene P. Schoch, director of the bureau of industrial chemistry at the University of Texas.

In the new process, based on the principle of the neon light, Dr. Schoch utilizes methane, the chief constituent of natural gas, converting it to acetylene by an electric current, which produces a glow like that of a neon tube.

Dr. Schoch said "the low percentage of energy loss is one of the most important theoretical results attained because it gives a basis for expecting liquid hydrocarbons to be produced from methane by electric discharge at a cost comparable with that of the Fischer-Tropsch process."

Acetylene itself, he said, is a vital industrial commodity. The oxyacetylene torch is widely used for welding and for cutting steel plate, and the gas is employed as a raw material in the manufacture of dyes, explosives, synthetic rubber, plastics, and agents for tanning leather. It is also used to enrich fuel gas.

Bureau Tells of Lower Costs for Synthetic Fuel

A significant reduction in the cost of synthetic gasoline and oil now being produced experimentally from coal is promised by new refinements in processing techniques, Dr. Henry H. Storch, chief of the research and development branch of the Office of Liquid Synthetic Fuels, United States Bureau of Mines, Bruceton, Pa., recently revealed at a meeting of the Pittsburgh section of the American Chemical Society at which he received the section's Pittsburgh award for 1948.

Dr. Storch explained that definite progress has been made in a comprehensive study of coal and its chemistry aimed at finding the most efficient process for combining hydrogen with carbon in coal to form liquid fuels, although no commercial quantities of gasoline or light oil have been made from coal.

In the Bruceton laboratories, a basically new approach to the problem of synthetic liquid fuel production by direct hydrogenation of coal is under investigation, he reported, and is a departure from the conventional Bergius process utilized by the Germans. In the Bergius process, it was explained, coal dust is mixed with oil to form a paste, which is then treated with hot hydrogen under a pressure of more than 2,000 psi. The Bureau of Mines is trying to get better results by using moderate pressures and relatively high temperatures, Dr. Storch related.

The cost of compressed hydrogen constitutes about 50 per cent of the total cost of liquid fuels prepared by hydrogenation of coal, Dr. Storch said, and that another large part of the total cost are capital charges on the investment and maintenance of equipment.

Another process, in which coal is dissolved before being treated with hydrogen, is also under investigation. Research is now directed at determining the best solvent and also at discovering suitable catalysts to speed the hydrogenation under these conditions. This process would be conducted at relatively low temperatures and pressures, Dr. Storch said.

Shale-Oil Test Runs Exceed Expectations

Initial test runs in a new continuous-type retort at Rifle, Colo., which exceeded expectations, brought one of the major problems in converting oil shale to useful liquid fuels, a step near solution, according to an announcement made by the U. S. Bureau of Mines.

The plant now in operation was designed for a capacity of 25 tons a day. Oil recoveries have exceeded the Fischer assay value of the 30 gal. per ton used. When spent shale processed in this initial test also was assayed it yielded no additional oil, indicating that extraction was complete.

In this process, shale crushed to small size passes continuously downward between two sets of louvers. Hot gases are driven across the downward-moving bed to retort the shale. Spent shale is withdrawn continuously at the bottom. The process will be thermally self-sustaining, for, in addition to the waste gas, the spent shale will be used for heating the required hot gases.

Under cooperative agreements, the Bureau of Mines has also supplied crushed oil shale to both Standard Oil Development Co. and Union Oil Co. of California for experimental

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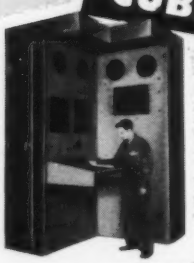

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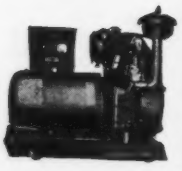

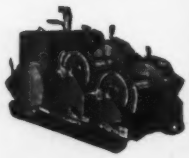

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processing in continuous retort pilot plants of their design. It is anticipated that this joint industry-government research ultimately will result in the development of a retort suitable for commercial-scale plants.

Aviation-Gasoline Analysis Reported in Bureau Survey

Commercial aviation gasoline marketed in the United States this year by 16 manufacturers are listed, along with their octane ratings and other characteristics, in the report of a Bureau of Mines semiannual survey recently released. Based on July 1948 production the report covers 66 samples of four grades of aviation gasoline tested in Bureau of Mines laboratories and gives inspection tests data on the same gasolines furnished by the manufacturers.

The survey, conducted in cooperation with the coordinating fuel and equipment research committee of the Coordinating Research Council, Inc., provides valuable information to aviation-gasoline manufacturers, aircraft-engine builders, airplane manufacturers, and airline operators. Products and tests data submitted by manufacturers are identified only by code numbers.

Results are shown for 19 samples of grade 80 aviation gasoline, 17 samples of 91-98 grade, 22 samples of 100-130 grade, and 8 samples of 115-145 grade. Also shown are characteristics ordinarily listed in aviation-gasoline specifications such as octane and performance numbers, tetraethyl lead content, dye color, distillation range, Reid vapor pressure, gravity, heat of combustion, and freezing point.

A free copy of the survey, "Report of Investigation," may be obtained by writing the Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

Three Tanks Completed at Groton, Conn., Terminal

The first three tanks of the $1,000,000 deep-water terminal being built at Groton, Conn., by New London Terminal Corp. have been completed.

Completion of the entire plant with a total storage capacity of 754,000 bbl. is expected by the fall of 1949 and may convert New London harbor into a major petroleum distribution point. The three storage tanks now in use have capacities of 150,000, 96,000, and 20,000 bbl.

Two of the tanks have already been rented to Socony-Vacuum Oil Co., Inc., on a 4-month lease and the third is being used by Ballard Oil Co. for storage of Nos. 5 and 6 fuel oils.

Seven additional tanks will be built, three of 96,000, two of 70,000, and two of 30,000-bbl. capacity. Other units planned include a tank-car siding which will accommodate six tank cars at a time, a steam plant, a rotary loading rack, barge loading lines, and dockage and equipment to unload the largest tankers.

When the plant is completed the terminal company intends to handle gasoline, kerosine, diesel fuel, and all grades of heating oils.

Du Pont May Construct Plant Near Victoria, Tex.

E. I. du Pont de Nemours & Co., Inc., has purchased one tract and has an option on another in the Guadalupe River valley, near Victoria, Tex., where it is planning construction of a chemical plant. The two tracts together include 1,700 acres, located about 72 miles northwest of Corpus Christi, Tex.

The company's ammonia department has concluded preliminary engineering studies of the site where it may locate a third plant for the purpose of making chemical intermediates for nylon.

If plans progress according to schedule, detailed design and preliminary preparations for construction will get under way early in 1949, company officials reported.

Pilger to Receive S.A.E. Award for Research

For research which inaugurated a new technique to determine engine deposits of sludge and varnish and bearing corrosion and which evaluates engine lubricants and gasoline when engine-design factors and operating conditions are known, Adolphus C. Pilger, Jr., research engineer for Tide Water Associated Oil Co., in Detroit, Mich., won the 1947 Horning Memorial Award of the Society of Automotive Engineers.

Presentation of the award will be made during the S.A.E. annual meeting in Detroit January 10-14. The award was voted to Pilger for a paper presented during the 1947 S.A.E. summer meeting at French Lick Springs, Ind.

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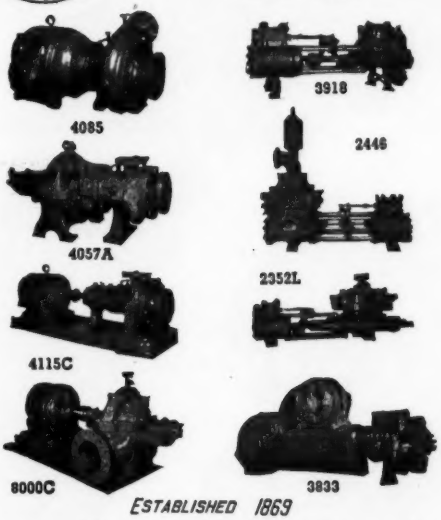

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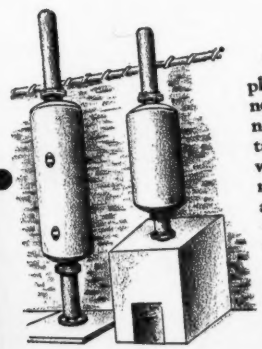

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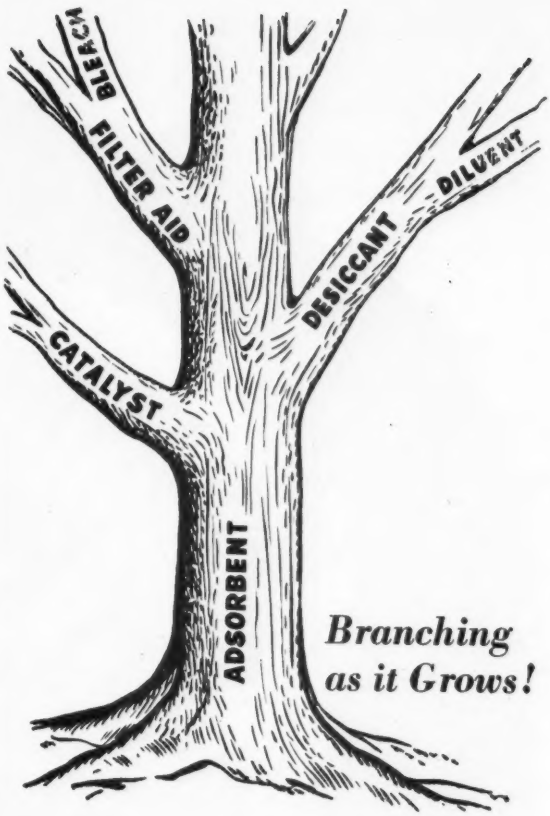

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Season's Greetings

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Among the

Drilling Contractors

Water-Well Drillers Elect Officers, Directors

Officers and directors of the Texas Water Well Drilling Contractors Association were recently elected at that organization's first annual meeting. This group, formed to advance the interests of water-well contractors, was organized last year.

The officers are: A. E. Fawcett, Jr., of Texas Water Wells, Inc., president; O. F. Jensen of Layne-Texas Co., vice president; and E. H. Talley, American Drilling Co., secretary-treasurer. Leo Petri of Raywood, C. J. Palmo of Dickinson, E. J. Rupp of Falfurias, and Carl Vickers of Corpus Christi, Tex., were elected to the 2-year post of director.

J. C. Hawkins has been awarded contract to drill O'Meara Brothers C-1 Long Bell Petroleum Co. et al, to the Wilcox. This test is located 4 miles west of Dry Creek townsite, Beauregard Parish, Louisiana, in 5-5s-7w.

Newman Brothers will drill Ryan, Hays & Burke 1 Otilia Garcia de Olivares, wildcat test, approximately 2 miles east of Sejita, in Duval County, Texas, located in Share 7 of Francisco Cordente grant. Contract depth is 4,500 ft.

Active Rotary Rig Totals Return to High Levels

Active rotary rig totals seem to be returning to the high mark of 2,457 set November 22, 1948. A recession at the end of November reduced the total to near the 2,400 mark. Active rigs for the weeks ended November 29 and December 6 follow:

	Nov. 29	Dec. 6
Pacific Coast	192	191
Oklahoma	283	286
Kansas	139	141
Rocky Mountain (including W. Canada)	239	221
Ark., La., Texas	186	182
West Tex. and N. Mex.	603	609
Gulf Coast	624	655
Illinois	140	151
Total	2,406	2,436

Loffland Brothers will drill Cox & Hamon 1 A. Cooley, a wildcat test in Meadows area, 26-4s-12w, in Beauregard Parish, Louisiana. Contract depth is 9,500 ft.

Olson Drilling Co. will drill Flour Bluff Oil Corp. 1 L. S. Girvin, 660 ft. from south and east lines of Section 84, Block 26, T-1-S, T&P Sur-

Falcon Seaboard daylight crew on Carter Oil Co. 1 Isaac Lacy in McClain County, Oklahoma. S. R. Knapp, toolpusher on the rig, is shown on the right, and next to him is the driller, Bert Boyd. K. S. Barnhart, mechanic, is standing second from the left

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vey. Contract depth is 7,500 ft., and rotary tools will be used. Location is 10 miles south of Lorraine, in Mitchell County, Texas.

Fain-Porter Drilling Co. has contract for Carter Oil Co. 2 Ella Shackleford, SW SE NW 31-2n-1w, in Garvin County, Oklahoma.

Union Drilling Co. has contract for Carter Oil Co. 1 A. J. Dumaw, SW NW NW 8-16n-17w, in Pentwater field of Oceana County, Michigan.

Nicklos Drilling Co., Houston, Tex., has been awarded contract to drill Pan American Production Co. 7-A Schlicher-Thomas Tr. 2, in Pine Prairie field of Evangeline Parish, Louisiana. Contract depth is 3,500 ft.

Dan Rives has contract for Burdell et al 1 Brashears, NW NW NE 30-3n-3e, southeast of East Pauls Valley field in eastern Garvin County, Oklahoma. Drilling will be carried to the Wilcox or 3,100 ft.

Mallard Drilling Co. has tools below 2,170 ft. in Westgat-Greenland Oil Co. 1 Howard, SE SW NW 15-23s-3w, 2 miles east of the Burrton pool in Harvey County, Kansas.

M. & M. Drilling Co. will drill Crosby Drilling Corp. and T. G. Markley 13 Baist Cooperage, in Bayou Blue field, Iberville Parish, Louisiana. Contract depth is 7,000 ft.

Bradley & Leeper will drill Burdell et al 1 C. E. Tate, SW SW NW 12-2n-2e, about 7 miles east of Wynnewood in Garvin County, Oklahoma. Contract depth is 3,500 ft.

Anshutz, Beech & Ward Drilling Co. has contract for National Cooperative Refinery Association 1 Hilgers, SW SW NW 30-9s-18w, 1 mile east of the Jelinek pool and 2 miles west of the Paradise Creek pool in Rooks County, Kansas.

A. W. Eggleston, Inc., has contract to drill Gulf Refining Co. 3 Lucien Savoie et al, in North Cankton field, St. Landry Parish, Louisiana, to a depth of 4,000 ft.

Gordon Drilling Co. has contract for Pure Oil Co. 5 H. H. Joseph, C W½ SE SE 7-25n-4w, in Crawford County, Michigan.

Miller & Banks will drill William Quinlan 1 Proffer, in the B. J. Thompson Survey A-1006, south-central Cooke County, Texas. Well is to be an Ellenburger test.

Helmerich & Payne, Inc., was scheduled to start their 7 Guinill, NW SW SW of 14-1n-1e, by December 21. This is to be a 2,000-ft. test in Garvin County, Oklahoma.

Jesse Russell has contract to drill George Kidd 1 McClintic et al, in southeast of Section 210, Block F of CCSD&RGNG Survey, southwest of McCamey field in Crane County, Texas. This will be a 3,300-ft. test.

Marco Drilling Co., Inc., will drill its 1 Ira Shurtz, SE NW NW 31-29n-1e, a 2,000-ft. test, in Kay County, Oklahoma.

Brunson Drilling Co. and Aledo Oil & Gas Co. have set surface pipe and are drilling ahead at 1 Dreiling, SE SE NW 9-13-18, 3 miles south of the Ubert pool in Ubert County, Kansas.

McCutchin Drilling & Production Co. will start immediately on its 2 University, 990 ft. from east and 330 ft. from north lines of Section 1, Block 31, University Survey, in Cochran County, Texas. Cable tools will be used to a proposed depth of 3,450 ft.

Commonwealth Drilling Co. has contract with Anglo Canadian Oil Co. and Home Oil Co. for Anglo-Home-Redwater No. 3, LSD 9 36-57-24w4.

Jackson Drilling Co. has started a 2,800-ft. test at 5-B Burton, NE SE SE 31-1s-2w, in the Tatums area of Carter County, Oklahoma .

Big Chief Drilling Co. has set conductor pipe in Vaughey & Vaughey 1 Seab, C SW SE 12-6n-2e, Franklin County, Mississippi. This well is 1½ miles north of a discovery well in a gas-distillate field southeast of Roxie, Miss.

Lewis Drilling Co. is rigging up rotary tools to drill Bay Petroleum Corp. 1 Tobin, NE NE SW 17-13-1w, 10 miles northeast of the Salina pool in Salina County, Kansas.

A. R. Jordan has contract to drill Burdell et al 1 W. C. Bonney, NW NW SE 24-13n-1e, east of Jones field in Oklahoma County, Oklahoma. Wilcox sand is the objective.

Permian Drilling Co. was starting its 1 Dow Pluckett, in the southeast of Section 107, Block 3 of T&P Survey, 12 miles southwest of Fort Stockton, Tex. This is to be a 3,000-ft. combination test.

Shawver-Graham, Inc., is contractor for C. L. Carlock 1 Basore, SW SW SW 25-25-2w, in Sedgwick County, Oklahoma.

Parker Drilling Co. has contract for Imperial No. 143, LSD 6, 7-50-26w4, and Imperial No. 149, LSD 2, 22-50-26w4, two new offset wells at Leduc. Parker is also contractor for Imperial-Woodbend No. 14, LSD 11, 9-51-26w4, about ½ mile south of the southwest corner of the proven Woodbend area.

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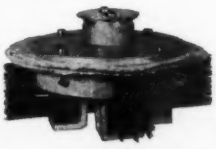

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and a

Happy New Year

If I had my wish I would like to be with each of our customers and friends for a few hours of true fellowship like we usually enjoy.
— Shep Miers.

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NATURAL GAS

Kansas May Intervene In FPC-Panhandle Case

THE Kansas Corporation Commission will seek to intervene in the attempt of Federal Power Commission to block the transfer of gas properties in Hugoton field, Kansas, from Panhandle Eastern Pipe Line Co. to Hugoton Production Co. The Kansas commission's intervention is in the interest of Kansas Power & Light Co., which has a contract with Hugoton to purchase about 300,000,000 cu. ft. of natural gas over a 15-year period. The contract calls for a price of 12 cents per M.c.f. Average Hugoton field price is 5.3 cents per M.c.f.

In addition to establishing a new top price the contract would assure Kansas Power & Light adequate gas reserves for the next 15 years. The company serves approximately 52,500 customers in about 50 Kansas towns. Current reserves of the company are estimated to be good for only 4 or 5 more years. If FPC is successful in blocking the transaction, the contract between Hugoton and Kansas Power & Light would be disrupted.

FPC is seeking to block the gas property transaction on the grounds that Panhandle Eastern has already committed the gas reserves involved, in justification for its application to FPC to build additional facilities. FPC had obtained a temporary injunction that for a time blocked payment of a Panhandle dividend in Hugoton stock, but a federal court dissolved the injunction, permitting Panhandle to proceed with the dividend.

FPC has stated that Hugoton Production was organized by Panhandle Eastern and that officers and directors of the two companies are identical. It has also stated that the two companies entered into a contract involving the issuance of 810,000 shares of Hugoton stock to Panhandle in exchange for $675,000 in cash and the transfer to Hugoton of Panhandle leases covering 97,000 acres of natural-gas lands in Hugoton field, Kansas.

Natural-Gas Revenues Up 17 Per Cent for 1947

Operating revenues of natural-gas companies subject to Federal Power Commission jurisdiction totaled $800,184,000 during 1947, an increase of 17 per cent over 1946 revenues, according to the commission's annual publication, "Statistics on Natural Gas Companies." Natural-gas sales by these companies for the 1947 period totaled 3.31 trillion cubic feet, or 16 per cent more than 1946 sales of 2.86 trillion cubic feet.

The publication was compiled from reports filed with the commission by 114 natural-gas companies during 1947 and contains both financial and operating data.

Of the total 1947 revenue, $796,809,000 came from natural-gas operations and $3,375,000 from manufactured-gas activities.

The report pointed out that during 1947 natural-gas service was supplied by these companies to an average of 5,448,000 customers, of which 5,447,295 were ultimate consumers and the remaining 705, other gas utilities. Gas sales to ultimate consumers totaled 1.4 trillion cubic feet and revenues from sales amounted to $452,964,000. Sales to other utilities were 1.9 trillion cubic feet with revenues of $327,749,000, the publication reported.

Colorado-Wyoming Account Adjustment Gets Approval

The Federal Power Commission has approved accounting adjustments proposed by Colorado-Wyoming Gas Co., of Denver, Colo., to dispose of $137,628.46 representing a reduction in the amount claimed by the company as original cost of its gas plant. The order requires that $101,000 of the adjustments be charged to capital surplus and $36,028.46 to earned surplus.

In approving the disposition plan, FPC specified that the company must "properly" create the capital-surplus account by complying with the Public Utility Holding Company Act of 1935 and the rules, regulations, and order issued by the Securities and Exchange Commission.

Dominion Natural Opens Port Stanley Gas Plant

The new $2,500,000 oil-gas plant of the Dominion Natural Gas Co. in Port Stanley, Ontario, was recently opened. Utilizing a "twin generator" process, the plant is the second of its kind in Canada and the first to be operated by Dominion Natural Gas. It will process oil to produce up to 6,000,000 cu. ft. of gas daily, the output being used to supplement natural gas in meeting the winter peak-load demands on the widespread Dominion distributing system.

Gas Company to Use Radio

CHATHAM, Ont.—Union Gas Co. of Canada, Ltd., has begun installation of a private radio network to assist in directing the rapid dispatch and control of gas from production and storage areas to consumers. The system, operating on a frequency of 162.69 megacycles, will consist of seven stations and four mobile units, and will operate on a 24-hour basis.

Natural Gasoline

Two Plants Scheduled For Benedum Field

Two natural-gasoline plants, each having a capacity of 60,000,000 to 80,000,000 cu. ft. of gas daily and totaling expenditures of about $12,000,000, are scheduled to be constructed in the Benedum field in east-central Upton County, Texas, according to W. M. Griffith, vice president of Plymouth Oil Co.

Contract for one of the plants, which will be built by Plymouth, has been let to Hudson Engineering Co., Houston. Slick-Urschel, to build the other plant, has awarded contract to Texas Natural Gasoline Corp., San Antonio, Tex.

Residue gas will be taken by the El Paso Natural Gas Co. 150-mile 20-in. line which will extend from Jal, N. M., field.

The Santa Fe Railroad will lay 6 miles of spur track to the Benedum area from its line near Flat Rock, approximately halfway between Rankin and Texon.

Liquid hydrocarbon content of the gas in Benedum field is approximately 2 gal. per 1,000 cu. ft.

Midland Stock Purchased by Warren and Chicago Corp.

Warren Petroleum Corp. and Chicago Corp. have purchased all of the outstanding capital stock of Midland Gasoline Co. not already owned by Warren Petroleum. Acquisition by Chicago Corp. was through a wholly owned subsidiary.

Midland owns and operates a natural-gasoline plant in Conroe oil field, Texas, and currently is producing approximately 45,000 gal. daily of natural gasoline and liquefied petroleum gases.

The company will be operated under Warren management, subject to a board of directors composed equally of Warren Petroleum and Chicago Corp. representatives.

BAASH-ROSS

Baash-Ross News

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OUR 28th YEAR

...and again something new from BAASH-ROSS

Baash-Ross Type "UC" Casing Slips

BECAUSE A STRING of casing has a relatively thin wall in relation to its diameter, it is much more easily damaged by unequal slip pressure than are drill pipe or tubing. Yet the weight of a string of casing—particularly under modern deep-hole drilling operations—can be extremely great... *so great, in fact, that even a slight misalignment of the slips or a moderate concentration of slip pressure can cause serious damage to the casing and might even result in losing the casing string down the hole.*

But such risks are now minimized through development by Baash-Ross of a new type of casing slip—the Baash-Ross Type "UC" Casing Slip. The Type "UC" Casing Slip consists of multiple segments, flexibly linked together so that they *w-r-a-p* around the casing like a chain tong to fit the exact curvature of the casing. Each individual slip segment takes the *same* uniform grip on the surface of the casing because *all* of the segments are unitized together—*act* as a unit, *set* as a unit, *grip* as a unit. This assures uniform slip pressure around the full circumference of the casing, eliminating risk of concentrated pressures that crimp the pipe and egg-shape the casing.

THREE BASIC BODY SIZES HANDLE WIDE RANGE OF CASING DIAMETERS

And here's an important point... Only *three* basic body sizes of "UC" Casing Slips are needed to handle *all* popular casing sizes from 7⅝" through 13⅜". As shown in the accompanying table, interchangeable liners are available for each of the three basic body sizes so that each size can be readily adapted to fit different casing sizes within its operating range...

Basic Body Size "UC" Casing Slips....	13⅜"	10¾"	9"*
Interchangeable liners available to fit.....	13⅜"	10¾"	9"
	11¾"	9⅝"	8⅝"
			7⅝"

**Fits bore and taper of standard rotary table.*

LINERS EASILY REPLACED

The liners in "UC" Casing Slips have ample length and are so designed that they will cut through pipe scale and any surface coating on the casing to take a firm, slip-proof grip *without damaging the surface of the casing itself.*

And if at any time after long usage, the liners become dull—or when changing from one casing size to another as outlined above—they can be quickly and inexpensively replaced. Simply pull a stainless steel pin, replace the old liner with a new one, slide the pin back in place and the job is done. The stainless steel pins eliminate risk of corrosion and assure easy liner replacements. Furthermore, it is important to note that none of the load of supporting the casing string is placed on retaining pins, bolts or any other parts that can become sheared or lost in the hole. *For maximum safety and strength all weight on the liners is transferred directly to the Slip body itself!*

HERE IS WHY *every casing job needs the protection of Baash-Ross "UC" Casing Slips!*

Because casing has a thin wall in relation to its diameter, it is easily crimped or damaged by even small misalignments that would not affect thicker-walled drill pipe or tubing.

If casing diameters vary slightly or if the slips are not set at exactly the same level, conventional rigid-type slips cause concentrated slip pressure that can crimp, bottle-neck or squeeze the casing out-of-round.

Such damage not only risks dropping the casing string, but the bulged or egg-shaped areas can cause poor joint make-up as well as tight spots through which tools cannot pass. Moreover, wear concentrated on the bulged spot leads to premature casing failures.

The flexible unitized design of Baash-Ross Type "UC" Casing Slips eliminates risk of one portion setting higher or lower than the other... and the multiple narrow segments assure an accurate, safe grip that exactly fits the curvature of the casing.

RESULT—there is no concentrated slip pressure—no misalignment of slip segments—no risk of damaging the thin walls of even the longest and heaviest casing strings!

Type "UC" Casing Slips are light, compact and easy for the crew to handle on even the longest and heaviest casing jobs. And they are so inexpensive that every casing job you run can have the protection of this new slip advancement. Your nearest Baash-Ross representative will be glad to supply full details... or write direct.

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Exploration and Drilling

SE New Mexico Gets Interesting Simpson Strike

INTEREST in pre-Permian prospects in Southeast New Mexico has been on a steady upward trend for some time, but a strike by Continental Oil Co. has given it a substantial boost. Continental et al 1-B-29 Warren, NW SE 29-30s-38e, Lea County, on test, flowed 441 bbl. of oil in 3 hours, through a 1-in. opening on 2½-in. tubing, from the McKee sand section of the Simpson in the Ordovician.

The well flowed gas at the rate of 2,300,000 cu. ft. daily, and the estimated gas-oil ratio during the test was about 670 cu. ft. per bbl. The well flowed naturally, oil was clean, and there was no sign of formation water. Flow was from open hole at 8,947-9,070 ft., flowing pressures, 525 psi. on casing, and 325 psi. on tubing.

During drilling the McKee sand had shown no signs of being a producer, but on testing, proved to be an excellent producer. Permian Basin operators and geologists are taking note of this interesting development and wondering if they have passed up McKee production in other wells in the past. This was once true of Devonian chert production, i.e., passed up in many wells because of lack of indications during drilling. Subsequently the Devonian proved to be a major producing horizon. Examination of drill cuttings under fluorescent light proved to be the clue to Devonian worth drill-stem testing.

The next question is what does the new well open up in the way of new territory. It may mean a 6-mile north extension of the Brunson pre-Permian production. If so, it will mean a cautious drilling program. The Brunson pre-Permian is a knife-edge oil accumulation at the truncated pinchouts of the Ordovician and Silurian against a granite peak. In a width of about 1 mile, roughly east-west, production may come from first the Ellenburger, then down the steeply dipping flank, from the Simpson, then Montoya, all Ordovician members, and finally from the Silurian.

Some geologists visualize possibilities of this knife-edge accumulation as a rim around a major uplift and therefore a rim that may extend for 30 to 40 miles in one continuous narrow band. This group will now consider the Conoco well has proven another 6 miles of the narrow rim. However there are other geologists who think that instead of one continuous structure, there are likely to be several that will lie en echelon in a general trend, but with gaps between.

Both groups are speculating about possible relationships between the new Conoco well and the Pennsylvanian production opened some time ago in the Skaggs area, about 3 miles west and 1 mile north of the present Simpson discovery. When this Pennsylvanian production was developed, wells were drilled through the McKee sand, but as there were no encouraging signs while drilling, the McKee was not tested. Now that it is known that the McKee can yield big wells in spite of nothing showing while drilling, the Skaggs area is a question mark.

As if this were not enough for the geologists to worry about, they now have to fit another McKee sand discovery into a regional picture. The Amerada Petroleum Corp. 5-F State, in 36-19s-36e, just about 11 miles northwest of Conoco's Warren, is also a McKee sand discovery, flowing 197 bbl. of 47°-gravity oil in 24 hours through a ¼-in. choke, with a gas-oil ratio of 3,020 cu. ft.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

SOUTH LOUISIANA.—The deepest oil zone tested in the world is in Shell Oil Co., Inc., A-1 J. A. Smith, Week's Island, Iberia Parish. Through perforations at 14,904-12 ft., using a 26/64-in. choke, the well flowed 672 bbl. of 44.5°-gravity oil per day with 400 psi. flowing pressure on tubing. Total depth is 15,094 ft. Operators are continuing to test other oil sands.

ALABAMA.—In Washington County, Alabama, approximately 8 miles west of the town of Chatom, Humble Oil & Refining Co. 2 J. R. Williams, 21-6n-4w, is reported drilling at 15,079 ft. This is the deepest drilling well in the southeastern area. All information except the drilling depth is being withheld.

WEST TEXAS.—Upton County wildcats held attention this week. Magnolia 1-A TXL was believed to be a confirmed producer in the Ellenburger. At last report it was drilling below 12,787 ft., 257 ft. into the formation and showing oil throughout the section. It was to stop at 12,805 ft. for another test. Richardson & Bass 1 Neal, north and west of the Benedum Ellenburger area, had flowing oil in the Pennsylvanian.

NORTH LOUISIANA.—Hunt Oil Co. completed the first Smackover well in the East Haynesville area of Claiborne Parish. At a time when Smackover production is said to be dropping off in the Haynesville field, it may prove an important extension to that field.

ROCKY MOUNTAIN AREA.—British-American Oil Producing Co.'s Clark's Fork, Carbon County, Montana, wildcat encountered staining in the Lakota and on drill-stem test recovered gas and distillate. The operator is coring ahead for a test of the Sundance, Tensleep, and Madison zones. Casing has been cemented and the operator is now testing at the interesting new pay discovery in the Madison at Argo Oil Corp.'s Hamilton Dome deep test.

CANADA.—Hopes of the largest oil reserve in Canada were strengthened when Imperial-Redwater No. 3 recovered 300 ft. of oil in 1 hour. The new successful step-out is located approximately 4½ miles southeast of the discovery well, indicating that the producing structure may extend 10 or more miles on a southeast-northwest trend.

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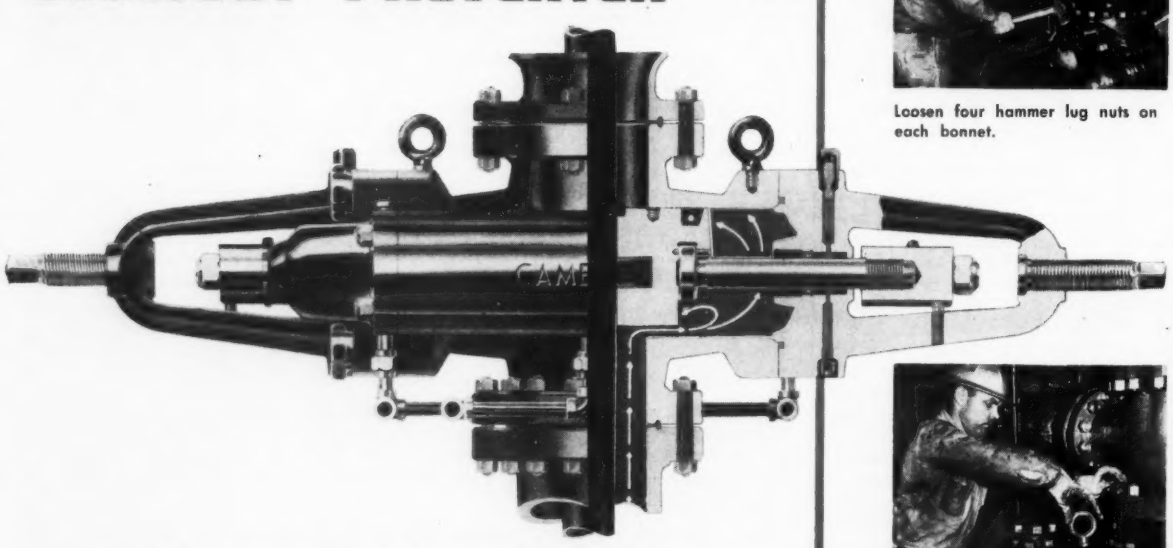

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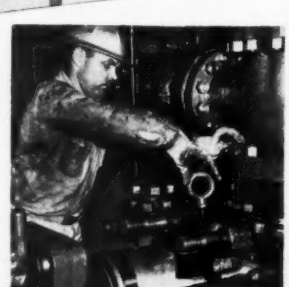
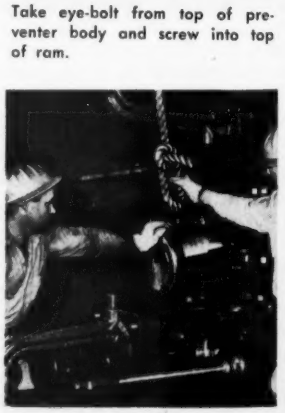


Take eye-bolt from top of preventer body and screw into top of ram.



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SOUTHWEST TEXAS

New Atascosa Discovery Now Getting Final Test

CORPUS CHRISTI. — McFarland Drilling Co. 2 Henrietta Krisch et al, new oil discovery 3 miles north of Poteet, in Atascosa County, flowed at the rate of 185 bbl. of oil per day through $\frac{7}{8}$-in. choke, with 125 psi. tubing pressure. Final gage has not been made; however, rig has been moved to a new location. Production is from the Anacacho lime section, which comes in below the Navarro sand and just above the Austin chalk. The well cored a saturated sandy lime section in this zone at 3,573-86 ft., and shale below that at 3,586-3,612 ft., and is completed in open hole, from 3,573-3,612 ft. Total depth is 3,612 ft., with 4-in. casing set at 3,573 ft. on top of the pay.

Kirkwood & Morgan, Inc., and Placid Oil Co. 1 Louis Eisenhauer, in Atascosa County, 10 miles southwest of Poteet and 10 miles north of Charlotte, in Diego Perez Survey 1194, is attempting to bring back the flowing oil which the well first tested when opened up from open hole at 5,143-81 ft. This well blew out at 5,181 ft., stuck the drill pipe at 5,143 ft., cemented it there for completion attempt, and came in flowing an estimated 250 bbl. of oil and mud per day through a ½-in. choke while cleaning. Tubing pressure ranged from 220 to 340 psi., with casing pressure of 900 psi. Then the well began to make mud, and soon died altogether. Operators moved off the drilling rig and moved on a workover rig, pumped water into the hole, lost returns, started swabbing.

Potential gage has been run on William Herbert Hunt Trust Est. 4 Spencer-Kent-Crane, discovery well of a new, deeper, oil pay zone for Fulton Beach field of Aransas County. The well made a flow of 163.71 bbl. of 42.3°-gravity oil per day through 11/64-in. choke, with 600 psi. tubing pressure and casing sealed, gas-oil ratio 692. Production is through perforations at 7,484-89 ft. Top of the pay zone 7,484 ft. Total depth is 8,994 ft.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Caldwell County: C. H. Robertson & R. L. Turner 1 J. M. Rutledge, in Isaac Jackson Sur., 8 mi. N of Lockhart, dry, TD 1,685 ft.

Duval County: American Republics Corp. 1 Dionicio Salinas, in Seale & Morris Sur. 230, 1¼ mi. N of Rosita field, dry, TD 4,125 ft.

Jim Hogg County: Amerada Pet. Corp. 1 Mary A. Yeager, Sur. 101, near Webb County line, 10 mi. W of Hebbronville, dry, TD 4,008 ft.

Jim Wells County: Rupert Cox & Dan L. Clark 1 Joe Stelzig, in I&GNRR Sur. 30, 14 mi. N of Alice, dry, TD 1,003 ft.

McMullen County: Dan R. Foster 1 Ben F. Foster (fee), Sec. 28, Two River Ranch Subd., 6 mi. E-SE of Tilden, in CEPI-&M Co. Sur. 24, dry, TD 1,405 ft.

J. C. Palmer et al 1 John Murphy, AB&M Sur. 123, 8 mi. N of Seven Sisters, dry, TD 2,620 ft.

Medina County: A. J. Pollan et al 1 Ida Foh, in Sur. 157, 9 mi. SW of Hondo, dry, TD 1,745 ft. Top Georgetown 1,622 ft., top Edwards lime 1,680 ft.

Nueces County: Rand Morgan AA-2 fee, North King area, in Lot 2, Sec. 7, Ragland Farm Trs., 8 mi. NW of Agua Dulce, dry, TD 5,860 ft.

San Patricio County: Southern Minerals Corp. 1 B. Randall et al, in Geo. Morris Sur., 3½ mi. W of Sinton, dry, TD 6,809 ft.

H. M. Amsler 1 D. O. Crumpton, in Sec. 69, Geo. H. Paul's Subd. of Coleman-Fulton Pacture, ½ mi. SW of NW sector of Midway field, dry, TD 8,015 ft.

Webb County: J. N. Abel & Weaver & Sharp 1 Lod Moglia Est., Sur. 672, 8 mi. N of Bruni and 1½ mi. NE of West Cole field, dry, TD 2,877 ft.

Edwin B. Cox & Jake L. Hamon 1 A. M. Bruni Est., in Sec. 7, Arispe Grant, 1½ mi. E of Bruni, dry, TD 2,750 ft.

Dulaney Oil Co. 1 A. M. Bruni Est., Sur. 2083, 9 mi. SW of Mirando City, dry, TD 2,656 ft.

SOUTH LOUISIANA

Record Deep Sand Tested At Week's Island Dome

NEW ORLEANS.—Shell Oil Co., Inc., continues to test record deep oil sands in the A-1 J. A. Smith, a deep exploration at the Week's Island dome, 18-14s-7e, Iberia Parish. On test through perforations at 14,-904-912 ft., using 26/64-in. choke, the well flowed 672 bbl. of 44.5°-gravity oil per day with 400 psi. flowing pressure on the tubing. The flow also had 10,000,000 cu. ft. of gas daily, gas-oil ratio being 16,200. These perforations were squeezed and pipe reshot from 14,243-55 ft. On a 10/64-in. choke, the well kicked off and flowed 420 bbl. of 33°-gravity oil per day with flowing pressure on the tubing at 2,600 psi. Operators continue to test other sands in the well. Total depth is 15,094 ft., with 7⅝-in. protection pipe cemented to 14,360 ft., and a 5-in. liner from this point to 14,974 ft.

A new gas-condensate pool for Fordoche Prospect in Pointe Coupee Parish is being opened by The Texas Co. 1 Joseph Oscar Long et al, located approximately 1 mile northeast of Littie townsite in Section 29-6s-8e. Drilled to a total depth of 10,280 ft., with perforations at 8,997-9,003 ft., the well flowed 5,400,000 cu. ft. of gas per day and

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an ungaged amount of condensate through a 10/64-in. choke. Flowing pressure on tubing was 2,925 psi., shut-in pressure 3,200 psi. These perforations were squeezed off and pipe reshot from 8,828-37 ft., for the next test, which flowed 156 bbl. of 59°-gravity condensate along with 3,761,000 cu. ft. of gas per day through a ¼-in. choke. Flowing pressure on tubing 3,100 psi. Gas-condensate ratio 24,109. Operators have squeezed off this pay zone and will test another sand section from 8,406-14 ft.

Sohio Petroleum Co. 1-B Harry B. Nelson opened the Sunshine pool, a new oil discovery, in the extreme eastern portion of Iberville Parish, in Section 14-9s-1e, 8 miles west-northwest of St. Gabriel field, just east of the Mississippi River. Total depth is 11,023 ft., with 7-in. casing cemented on bottom. On initial test the well flowed 60 bbl. of 29.4°-gravity oil per day, plus approximately 60 per cent water content, through a 16/64-in. choke, with flowing pressure on tubing 25 psi., casing pressure 800 psi.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Iberville Parish: New oil pool "Sunshine"—Sohio Petroleum Co. B-1 Harry B. Nelson, 14-9s-1e, 8 mi. W-NW of St. Gabriel field and on east side of Mississippi River, TD 11,023 ft., top sand 11,310 ft., perf. 10,310-15 ft., IP: 60 bbl. oil per day through 16/64-in. choke, TP 25 psi., CP 800 psi., gravity 29.4°, plus 60 per cent water.

Jefferson Parish: New oil pool, "Block 16" Humble Oil & Refg. Co. 1 State-Caminada Pass, Lease Acct. No. 4, Grand Isle area, Block 16, State Lease 799, Tract 1114, 7½ mi. SW of No. 1 Block 10, Grand Isle discovery, TD 8,259 ft., top sand 4,584 ft., perf. 4,584-96 ft., IP: 219 bbl. oil per day through 5/32-in. choke, GOR 297, TP 800 psi., 38° gravity, no water.

SOUTH LOUISIANA WILDCAT FAILURES

Avoyelles Parish: Hiawatha O. & G. Co. 1 W. T. Nolen, in 26-1n-5e, 3 mi. SW of Plaucheville and 9 mi. NE of Eola production, dry, TD 10,502 ft.

Camerson Parish: Humble Oil & Refg. Co. 2 State Lease 1255-Calcasieu Lake, Twp. 14s-9w, in lake, dry, TD 13,146 ft.

Evangeline Parish: S. W. Richardson, Inc., 1 Stanolind-Elsie Vidrine, 12-5s-2w, 4 mi. SW of Reddell production, 5½ mi. due W of Mamou townsite, dry, TD 13,407 ft.

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TEXAS GULF COAST

New Oil Field Opened Southeast of Port Lavaca

HOUSTON.—A new oil field in Calhoun County, 6½ miles southeast of Port Lavaca, has been opened by Southern Production Co. 1 Melbourne, Block 4, Burton & Hoover subdivision, in Benito Morales Survey, A-28. The well gaged 179 bbl. oil per day through a ⅞-in. choke, with 1,100 psi. tubing pressure, making 38.5°-gravity oil with gas-oil ratio of 2,000. Production is through perforations at 8,587-97 ft. Total depth is 10,008 ft., with 5½-in. casing set to 9,585 ft.

Humble Oil & Refining Co. 1 East Mayes Gas Unit 1, has been completed in a new producing zone in East Mayes field, Chambers County. Drilled to a total depth of 10,000 ft., with 5½-in. casing at 9,998 ft., the well flowed 257 bbl. of 58.2°-gravity condensate per day with 5,420,000 cu. ft. of gas per day, through a ¼-in. choke. Open flow calculations was 85,000,000 cu. ft. of gas with flowing pressure on the tubing at 2,865 psi. Shut-in pressure was 3,080 psi. Gas-condensate ratio 21,100. Production is through perforations in the Frio from 8,850-53 ft. Well is located in E. H. R. Wallis Survey, Abstract 366.

Sun Oil Co. A-1 Middleton, E. Moss Survey, wildcat 1 mile north of Oyster Bayou field in Chambers County, is being completed as a gas discovery well from 9,207-10 ft. Open flow gage was 18,000,000 cu. ft. of gas daily plus some 52.2°-gravity condensate. Flowing pressure on tubing was 3,250 psi. while on a 12/64-in. choke. Shut-in pressure is 3,485 ft.

Hassie Hunt Trust 1 Ollie Webb, wildcat 3 miles northeast of Charco in Goliad County, in Maria de Jesus Y'Barbo grant, on test at 7,579-89 ft., through ¼-in. chokes, recovered 450 ft. of water cushion cut with condensate and 2 ft. of clear condensate, 90 ft. of mud, bottom-hole flowing pressure was 2,900 psi. This well previously showed oil production from the Yegua zone, where test at 4,207-14 ft. developed 45 psi. working pressure in 10 minutes through ¼-in. chokes, and recovered 450 ft. of water cushion plus 720 ft. of pipeline oil. Operators now are drilling ahead below 7,750 ft.

TEXAS GULF COAST (DISTRICTS 2 & 3) SUCCESSFUL WILDCATS

Chambers County: New gas-condensate pay, East Mayes pool—Humble Oil & Refg. Co. 1 East Mayes Gas Unit 1, E. H. R. Wallis Sur., TD 10,000 ft., top sand 8,850 ft., Frio, perf. 8,850-53 ft., IP: 257 bbl. condensate per day through ¼-in. choke, and 5,420,000 cu. ft. gas per day, GOR 21,100. Open flow 85,000,000 cu. ft. gas per day, TP 2,865 psi., shut-in pressure 3,080 psi., gravity 58.2°. No water.

Hardin County: New oil pool—Gulf Oil Corp. A-1 Richard Teel Estate, Thos. C. Gaines Sur., 6,750 ft. from nearest production off southwest flank of Saratoga dome, TD 5,119 ft., top sand 4,446 ft., perf. 4,446-60 ft., IP: 101 bbl. oil per day through 9/64-in choke, GOR 570, TP 610 psi., gravity 36.7°, 0.4 per cent water.

Liberty County: New gas-condensate pay, Cottonwood pool—William Helis & Hirsch Estate, in T&NO Sec. 17, TD 8,200 ft., top sand 7,942 ft., Hackberry, perf. 7,943-54 ft., IP: 1,900,000 cu. ft. gas

and 84 bbl. condensate per day through 10/64-in. choke, GOR 18,650. Open flow 26,500,000 cu. ft. gas per day, TP 2,820 psi., shut-in pressure 2,860 psi., gravity 46.5°.

TEXAS GULF COAST (DISTRICTS 2 & 3) WILDCAT FAILURES

Brazoria County: Jack W. Frazier-Salt Dome Oil Corp. 1 Gamble et al, E. Little Sur., Lot 6, 3 mi. N of Manvel, dry, TD 6,055 ft.

Harris County: Dr. J. DeDeau 1 Lester, in Geo. Sultbaugh Sur., A-747, 20,000 ft. S. of Aldine townsite, dry, TD 4,130 ft.

Howard C. Meyer 1 T. R. Wunsche Hrs. et al Unit 1, in Wiley Smith Sur., ½ mi. W of Spring townsite, dry, TD 6,525 ft.

Stewart Pet. Co. et al 1 Doris Japhet et al, in Jno. Dunn Sur., A-236, 1 mi. W of Dyersdale production, dry, TD 4,101 ft.

Jackson County: Akron Prod.-Mid-Continent 1 M. J. Johnson, in I&GN Sur. 3, northwest of North Cordele field, 12 mi. NW of Ganado, dry, TD 4,360 ft.

Karnes County: H. L. Hunt 1 W. S. & O. L. Cochran, in D. D. McConnell Sur., 23 mi. NE of Karnes City, dry, TD 6,981 ft.

Newton County: The Chicago Corp. 1 Temple Lumber Co., in Jesse Terry Lge., 18 mi. NE of Newton townsite, dry, TD 9,218 ft.

Wharton County: Claud B. Hamill 1 Mary E. Rankin, in ETRR Sur., 7 mi. S of El Campo, dry, TD 7,692 ft.

Wilson County: Luring O. & G. Co. 1 Peter Rutoski, in Casper Flores Sur., 4 mi. W of Falls City, dry, TD 5,105 ft.

EASTERN TEXAS

Henderson County Test Cores Below 11,496 ft.

DALLAS.—Stanolind Oil & Gas Co. 1 Tom and Walton Dupree, Henderson County wildcat in the Samuel Chears Survey, 5½ miles southeast of Athens, was coring below 11,496 ft. in sand and shale. Last recovery reported, from 11,445-496 ft., was 51 ft. of hard, gray shale and sand with no shows. Electric log tops released were: Midway 990 ft., Nacatoch 2,030 ft., Austin 3,750-4,130 ft., Paluxy 7,019 ft., Glen Rose 7,418 ft., Massive anhydrite 9,699-10,058 ft., and the James at 10,748 ft., on elevation of 460 ft.

A. O. Phillips 1 Bert W. Davis, wildcat south and slightly west of Nelta, Hopkins County, was preparing to abandon after running electrical log to 4,856 ft. Humble Oil & Refining Co. 1 E. N. Rylie, 4 miles southeast of Kemp in Kaufman County, was drilling shale and lime below 5,176 ft. Byrd-Frost, Inc., 1 R. H. Simons, Jose A. Mendez Survey, Leon County, was drilling below 6,350 ft. in hard shale.

Magnolia Petroleum Co. 1 L. W. Pierce, Smith County wildcat northeast of Mount Sylvan, was drilling sand at 4,922 ft. Sample tops placed the Austin at 4,690-4,890 ft., and the sub-Clarksville at 4,893 ft.

New operations in East Texas included wildcat locations in Trinity and Cherokee counties. Four miles northeast of Centralia, Trinity County, Gier & Jackson were preparing location for an Edwards lime test, on Houston County Lumber land, and 4,900 ft. from south and 150 ft. from west lines of the Alexander Henry Survey. It is said to be on a 2,460-acre tract acquired from Continental Oil Co. The proposed Cherokee County exploration will be W. M. Mitchell 1 Whiteman & Decker, in the G. W. T. Fulgham Survey, just east of Fastrill, and about 10 miles west of Alto. It will explore the Woodbine.

In Wood County, White-Webb Drilling Co., Dallas, had two operations in the Merigale-Paul field. The 1 B. A. Shirey, Daniel Fuller Survey, is a 2-mile southwest outpost to production, at which drilling was to start immediately. Between the Shirey location and the field, the 1 Newman, C. Hardiman Survey, was drilling ahead around 4,000 ft.

EAST TEXAS (DISTRICTS 5 & 6) WILDCAT FAILURES

Limestone County: H. L. Hunt 1 Union Central Life Ins. Co., A. W. Bates Sur., 14 mi. W Mexia, dry, TD 5,196 ft., Woodbine 1,950 ft., Rodessa 3,515 ft., Pettit 3,800 ft., Travis Peak 3,910 ft., Cotton Valley 4,565 ft.

Shelby County: M. E. Davis 1 W. A. Bridges, R. S. Forbes Sur., 6 mi. E Patroon, dry, TD 6,015 ft., Arkadelphia 2,190 ft., Pecan 2,522 ft., Austin 3,172 ft., Georgetown 3,648 ft., lower Paluxy 4,184 ft., elev. 267 ft.

Wood County: W. W. Bradley 1 Sulphur Springs State Bank, A. M. Ellis Sur., 4 mi. N Hawkins, dry, TD 5,722 ft., Nacatoch 2,410 ft., Woodbine sand 5,125 ft., no shows.

MICHIGAN

Two Discoveries Noted for State

MOUNT PLEASANT.—Two wildcat discovery wells, which had been under test for several weeks, were completed during the past week.

Frank E. Roush 1 Angus, SE SE NE 10-18n-4e, Standish field discovery, Arenac County, was in the Richfield at 4,111 ft. as a 30-bbl. producer after a reacidization with 4,000 gal. This wildcat was first drilled into the Richfield pay early in June. Immediately following the oil show, two new Richfield test wells were drilled in the district. Both were dry in the objective horizon.

Muskegon Development Co. 1 Haxel Grove School District, NE NE NW 9-12n-16w, Muskegon County, was completed natural with 30 bbl. of oil and a like amount of salt water showing daily during several weeks of pump testing. Another Traverse test, located ¼ mile diagonally northwest, was under test in the Traverse lime at 2,006 ft. with a slight natural oil show logged at that depth.

Four wildcat wells in Saginaw, Allegan, Ottawa and Van Buren counties were being tested with oil shows reported logged, while 5 other wildcat tests were completed as dry holes and 13 new producers were finished in six different fields. The Geneva Traverse field led all producing areas with five new completions. Three producers were finished in the Beaver Creek pool, two in the Fentwater field, and one each in the Hope, Salem and Stony Lake fields.

MICHIGAN SUCCESSFUL WILDCATS

Arenac County, Lincoln Township: Standish pool opener—Frank E. Roush 1 Angus, SE SE NE 10-18n-4e, 30 bbl. from Richfield, TD 4,111 ft.

Muskegon County, Holton Township: Muskegon Development Co. 1 Haxel Grove School District, NE NE NW 9-12n-15w, 30 bbl. with water, Traverse 1,992 ft., TD 1,994 ft.

MICHIGAN WILDCAT FAILURES

Kent County, Spencer Township: Smith Petroleum Co. 1 Schultz, NE NE SW 18-10n-9w, dry in Monroe, TD 3,146 ft.

Gaines Township: Turner Petroleum Corp. 1 Slachter-Palma Comm., SE NE SW 5-5n-11w, dry in Traverse, TD 1,882 ft.

Osceola County, Hartwick Township: Leonard Oil, Inc., and Gordon Oil Co. 1 Rush, SE SE SW 36-19n-8w, dry in Monroe, TD 4,213 ft.

Sherman Township: R. E. Fitcher and H. J. Chopard 1 Larson, SE NE SW 19-20n-9w, dry in Monroe, TD 4,007 ft.

St. Clair County, Wales Township: Arthur F. Etienne 1 Alexander, SE NW SW 3-6n-15e, dry in Dundee, TD 1,224 ft.

N. CENTRAL TEXAS

Hanlon-Boyle Finds New Strawn Production

WICHITA FALLS.—Hanlon-Boyle, Inc., 1 Oates opened a new Strawn sand area between the Walsh and Martin fields of southwestern Young County when it completed for a calculated daily potential of 192 bbl. of oil. The new well, in Block 1,672, TE&L Survey, flowed 96 bbl. of oil in 12 hours through 16/64-in. choke. Pay sand was from 2,906-12 ft.

L. T. Burns 1 Larrimore, Section 253, TE&L Survey, Young County, plugged back from 3,670 ft. to set casing on top of the Strawn sand. Last week a drill-stem test of the sand from 2,874-2,905 ft. showed gas in 5 minutes and oil flowed in 40 minutes under pressure of 975 psi.

In southwest Montague County, the reopened Eanes field gained a second completion and a new start. The completion was Star Oil Co. 1 Eanes, Berch Survey, which made a flowing potential of 134.4 bbl. daily through 10/64-in. choke. Tubing pressure was 500 psi. Pay is the conglomerate from 5,633-53 ft. Star's new operation is the 1 W. B. Smith, located 330 ft. from south and 2,950 ft. from west lines of the W. R. Powell Survey, and southeast of the 1 Eanes. Contract depth on the new operation is 5,900 ft.

In southeastern Montague County, Continental Oil Co. A-1 Mrs. Golightly, H. Hadden Survey, A-346, about 7 miles southeast of Montague, recovered 1,860 ft. of clean oil and 270 ft. of salt water on a 2-hour drill-stem test of the conglomerate at 5,790-97 ft. It continued testing. Location is in the new Hundley area.

Three miles west of Joy in Clay County, and 1 mile west of production on the southern end of the Joy field, L. T. Burns 1 Scott, Gallatin Survey, completed in the Strawn sand at 4,508-38 ft., for 378 bbl. of oil in 24 hours. The flow was through ¾-in. choke on tubing, and was said to be one of the highest potentials for the area. The same operators spudded in for an east offset to the producer, at the 8 C. L. Wynn, Block 33, H. Williams Survey, and were drilling ahead below 3,240 ft. Seven miles west of Joy, Gulf Oil Corp. A-1 Scaling, 6,500-ft. wildcat in Section 19, H&TBRR Survey, was drilling below 2,500 ft.

In the Henderson area of southwestern Clay, L. T. Burns made location for the 1 M. L. Henderson, in Section 2,624, TE&L Survey. It is a 3,300-ft. Strawn test. Five miles southwest of Ringgold, Continental Oil Co. 1 N. T. Gaines, Section 24, Block 4, H&TCRR Survey, swabbed 32 bbl. of oil, with no water, in 24 hours, from the Caddo lime. Plugged-back depth is 5,036 ft.

Rotary equipment was being moved in this week for a 6,500-ft. wildcat to be drilled 2 miles south of Paradise in southcentral Wise County. The new test is Mid-Continent Petroleum Corp. 1 F. F. McBride, located 330 ft. from east and 990 ft. from south lines of the W. Burke Survey.

Standard-Fryer Drilling Co., Inc., made location for its 4 Morris 330 ft. from north and east lines of the NW NE Block 4, W. Bohn Survey. It is a west offset to the same operator's 1 Morrison, which recently extended the Chico field 4,000 ft. southwest. Standard-Fryer's 3 Morris was below 5,201 ft. in the conglomerate. A 30-minute drill-stem test from 5,131-92 ft. had an estimated 7,000,000 cu. ft. of gas daily, with no oil reported.

NORTH CENTRAL TEXAS (DISTRICTS 9 & 7-B) SUCCESSFUL WILDCATS

Brown County: United North & South Development Co. 1 A. J. Wheeler, B. W. Garvin Sur., 2, 4 mi. W May, flowed 26 bbl. oil a day, ⅜-in. choke, Ellenburger 2,710-35 ft., casing pressure 180 psi., GOR 2,600 cu. ft., TD 2,886 ft.

Fisher County: Lion Oil Co. et al 1 Hale, League 317, El Paso CSL, 2 mi. N Longworth, flowed 140 bbl. 37°-gravity oil a

day, 16/64-in. choke, Flippen lime 3,538-41 ft., tubing pressure 50 psi., GOR 200 cu. ft., TD 3,541 ft., elev. 1,966 ft.

Jones County: T. D. Humphrey 1 Annetta Lee Gray, Sec. 25, D&DA Sur., 2 mi. SW Avoca, flowed 147 bbl. 38°-gravity oil a day, 11/64-in. choke, King sand 2,110-22 ft., TD, tubing pressure 100 psi., GOR 300 cu. ft.

Throckmorton County: M. A. Grisham 1 Arlene Gregory, Sec. 1193, TE&L Sur., 8 mi. W Woodson, flowed 475 bbl. 42°-gravity oil a day, Mississippi 4,675-4,720 ft., TD, casing pressure 300 psi., tubing pressure 325 psi., GOR 410 cu. ft., elev. 1,361 ft.

Young County: Hanlon Boyle, Inc., 1 K. D. Oates, Sec. 1672, TE&L Sur., 2 mi. SW Murray, flowed 96 bbl. oil in 12 hours, pay 2,906-12 ft., TD, 16/64-in. choke, GOR 800 cu. ft.

Lipscomb & DeLange 1 W. T. Swink "A," Sec. 301, TE&L Sur., 10 mi. SW Olney, flowed 118 bbl. 42°-gravity oil a day, 8/64-in. choke, Mississippi 4,945-70 ft., TD, casing pressure 710 psi., tubing 625 psi., GOR 400 cu. ft.

NORTH CENTRAL TEXAS (DISTRICTS 9 & 7-B) WILDCAT FAILURES

Archer County: L. T. Burns 1 R. C. Gilbow, Sec. 1880, TE&L Sur., 6 mi. S Windthorst, dry, TD 4,322 ft.

Fain & McGaha 1 W. J. Koelher, Lot 13, Block 3, Clark & Plumb Subd., 2 mi. SW Scotland, dry, TD 5,002 ft.

J. B. Stoddard 1 W. F. Reilly, Sec. 13, Blk. 4, H&TC Sur., 2½ mi. SE Dundee, dry, TD 5,339 ft., Mississippi 5,155 ft., Ellenburger 5,313 ft.

Baylor County: Blackwell Oil & Gas Co. 1 Burrell Mills, Sec. 2429, TE&L Sur., 2½ mi. W Megargel, dry, TD 1,496 ft.

W. B. Hamilton 1 J. A. Hicks, J. H. Barclay Sur., 4½ mi. SE Seymour, dry, TD 1,975 ft.

Coleman County: Dale Smith and M. R. Rogers 1 M. L. Wheatley, Sec. 98, ETRR Sur., 10 mi. SW Santa Anna, dry, TD 1,902 ft.

Cooke County: W. F. Russell 1 Mary Inglish Griggs, E. Farris Sur., 3 mi. SW Hood, dry, TD 1,511 ft.

George W. Graham 1 J. C. Gregory, Harriett Nail Sur., 1½ mi. SE Hood, dry, TD 1,500 ft., Ellenburger 1,470 ft.

Kerr McGee Oil Industries, Inc., 1 Rushing, A. C. C. Bailey Sur., ½ mile E Gainesville, dry, TD 1,979 ft.

K. R. Neal 1 J. J. Krahl, Wm. Phelps Sur., 5 mi. S Gainesville, dry, TD 2,350 ft., Ellenburger 2,303 ft.

Eastland County: B. F. Gilchrist Oil Co. 1 T. M. Johnson, Sec. 11, Blk. 4, H&TC Sur., 2½ mi. NE Eastland, dry, TD 1,850 ft.

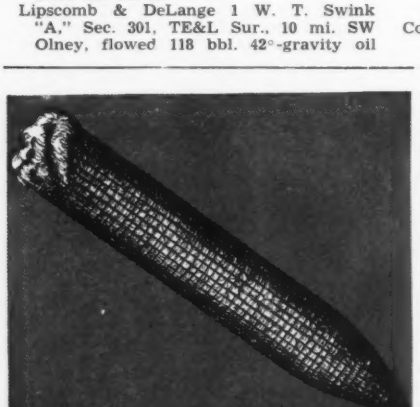
Dave Roche 1 T. E. Grisham, Sec. 32, Blk. 2, ETRR Sur., 4 mi. E Rising Star, dry, TD 2,946 ft., Caddo 2,577 ft., elev. 1,598 ft.

Haskell County: Geochemical Surveys, Inc., et al 1 Mable Cornelius, Sec. 140, Blk. 45, H&TC Sur., 1 mi. NE Weinert, dry, TD 5,469 ft.

Montague County: George W. Graham 1 Fred Wines, Blk. 95, Kaufman CSL, 10 mi. NE Nocona, dry, TD 3,075 ft.

John Shive 1 Viola Durham, R. H. Grimes Sur., 9 mi. NE St. Jo, dry, TD 2,485 ft.

Stephens County: Gilliam Drilling Co. 1 S. Copeland, Sec. 103, BBB&C Sur., 5 mi. W Strawn, SE corner of county, dry, TD 3,872 ft., Ellenburger 3,860 ft.



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MISSISSIPPI

Extension Well Testing In Sandy Hook Field

JACKSON. — In Marion County, approximately 1¼ miles north of the discovery well in Sandy Hook field, Union Producing Co. 2 Pittman, 12-1n-18w, recovered gas on two drill-stem tests. On 14-minute drill-stem test from 8,978-9,012 ft., using ¼-in. and ⅜-in. bottom chokes, gas hit surface in 30 seconds. Maximum top pressure at end of test was 1,625 psi. When drill pipe was pulled recovery was 70 ft. of water-clear condensate and 3 gal. of drilling mud. Bottom-hole flowing pressure was 4,025 psi. A drill-stem test, open 14 minutes, from 9,017-22 ft., using same chokes, recovered from drill pipe 65 ft. of 55°-gravity straw-colored condensate. If successfully completed this well will extend the Sandy Hook field 1¼ miles to the north.

Gulf Refining Co. 1 T. Brady, Jr., 19-6n-8e, in Mallalieu field, Lincoln County, has been completed flowing an initial production of 185 bbl. of 38.8°-gravity oil per day through a ¼-in. choke, tubing pressure 200 psi. Total depth is 10,480 ft.

Gulf 12 Bass, 9-1n-16w, in Baxterville field, Lamar County, has been completed on pump with initial production of 79 bbl. per day. Total depth is 8,870 ft.

Humble Oil & Refining Co. 12 G. M. & O. Land Co., 30-9n-7w, in Yellow Creek field, Wayne County, was completed on pump for initial production of 69 bbl. of 19.4°-gravity oil. Total depth is 5,189 ft.

Two wildcat starts were reported, one each in Noxubee and Pike counties. Seven development locations are two each in LaGrange and Yellow Creek fields, and one each in Heidelberg-East, Hub, and Mallalieu fields. Two wildcat failures were reported, one each in Chickasaw and Jefferson counties.

MISSISSIPPI WILDCAT FAILURES

Chickasaw County: O. W. Killam 1 W. O. Schenault, Center NW SW 14-14s-2e, dry, TD 2,785 ft.

Jefferson County: Wanete Oil Co. 1 Geo. W. Armstrong, 17-9n-1w, dry, TD 5,612 ft. Top Sparta 2,257 ft., Tallahasse 3,400 ft., Wilcox 3,578 ft.

ALABAMA WILDCAT FAILURE

Barbour County: R. G. Houser 1 L. D. Warren, Center NW NE 6-12n-28e, dry, TD 2,318 ft. in granite.

ROCKY MOUNTAIN

British-American Makes Encouraging Drill-Stem Test

DENVER.—On drill-stem test in the Lakota between 7,550-64 ft. at the British-American Oil Producing Co.'s Clarks Fork, Carbon County, Montana, wildcat, the recovery was 620,000 cu. ft. of gas daily with 105 ft. of distillate-cut mud. Flowing pressure was 900 psi. shut in 15 minutes. The top of Dakota was logged at 7,455 ft. and the test was made with total depth at 7,564 ft. Tool was open 30 minutes. Top of the Lakota was logged at 7,550 ft. and the well is now drilling below 7,602 ft. in the Morrison. This well is a Madison test and the recovery in the thin Lakota section is believed encouraging for the wildcat. The well is the 1 Government, C NE NE 26-9s-22e, and is located ½ mile west of a well drilled by General Petroleum Corp. in 1944 to the Frontier. General Petroleum produced approximately 8,000 bbl. of oil from the well when production was depleted. This well is located west of the Elk Basin and Northwest Elk Basin fields, near the Wyoming state line in the northern section of the Big Horn basin.

Oil was recovered on test of Wyoming Oil Co.'s Nowood wildcat, the 1 Government, SE NE NW 8-48n-90w, Washakie County, Wyoming, and the well will probably make a small producer in the Embar and Tensleep zones. The well found Tensleep at 1,610 ft. and was drilled to 1,638 ft., total depth, in sand. Water was recovered on test of the lower section, but casing will be run and the well tested in the lower Embar and upper Tensleep zones.

Casing has been cemented at the Argo Oil Corp. 41 Placer, SE NE SE 14-44n-98w, Hamilton Dome deep test, Hot Springs County, Wyoming, and the well is now being tested in the Madison. Top of Madison was logged at 3,105 ft. and the well was drilled to 3,506 ft., total depth, still in that formation. Saturation was encountered in the lime and the well flowed 9 bbl. of oil on one 15-minute test and 15 bbl. in a zone above in 30 minutes. This is the first well to be drilled to the Madison on top of the Hamilton Dome field, which produces oil from the Embar and Tensleep formations. Argo and Empire States Oil Corp. own the majority of present production in the field, and the new discovery will substantially increase reserves in this field.

Continued reports are circulated of distillate and gas production in Amerada Petroleum Corp.'s wildcat in the Green River area, Utah, the 1 Unit, SE NW NW 2-22s-16e, Grand County. The operator is now reported making production tests of the well with total depth reported at 5,645 ft. The well is a tight hole, with no formation tops or test reported by the operator. According to reports, the well is in the Paradox salt formation (Pennsylvanian) and considerable difficulty has been encountered in conditioning the well for tests. It is located on a unitized block on the northwest side of the Salt basin of Utah and Colorado. Shows of oil and gas have been found in several of the Salt basin wildcats, but production has not been sustained on thorough testing. Results of the present test will be of importance in future operations in this basin of Utah and Colorado as a number of large blocks are held in the area by major operators.

Stanolind's Big Sand Coulee wildcat, the 1 Unit, C SE NE 8-55n-100w, Park County, Wyoming, may be a failure. The well is at 13,235 ft., total depth, probably in Amsden formation, and the operator may abandon following further drill-stem tests of slight shows in the Phosphoria and Tensleep formations. Tensleep was found at 13,066 ft. and cores in the sand showed hard, tight sand with thin dead oil staining in fractures. This wildcat is located on the northwest side of the Big Horn basin, south of the Silver Tip field, which produces oil in the Frontier, Embar and Tensleep formations, and southwest of the Elk Basin field where a Madison oil development drilling program is now under way. The well was located following extensive seismic work in the area.

New locations.—There were 25 new locations with 16 of the wells in Wyoming, 5 in Montana, 3 in Colorado, and 1 in Utah. In Wyoming there were no new wildcat locations but several interesting extensions were announced. In the Fiddler Creek area, where two extension producers are now being completed in the Newcastle, four new locations were announced and it is probable that an extended drilling program will be carried on in the area. Another wildcat for the south-central Colorado area was announced with the farm-out of a 10,000-acre block by Colorado Fuel & Iron Co. to J. B. Stoddard, Dallas, Tex.

In Montana, the Utah Southern Oil Co. spudded a wildcat in the Little Sandy area at 1 Maxwell, SW SE SE 22-27n-13e, Chouteau County, and the second Coconino well in the Boundary Butte area, San Juan County, Utah, was announced by Western Natural Gas Co., Byrd-Frost, Inc., et al at 3 English, NW NW SW 22-43s-22e.

WYOMING WILDCAT FAILURES

Rawhide, Goshen County: General Petroleum Corp. 1 Lively, SE NE SW, 33-28n-63w, TD 2,885 ft., dry, Spearfish 1,185 ft., Minnekahta 1,560 ft., Opeche 1,592 ft., Minnelusa 1,650 ft., Bell sand 2,820 ft., elev. 4,629 ft. RB.

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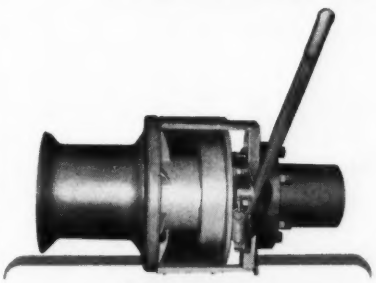

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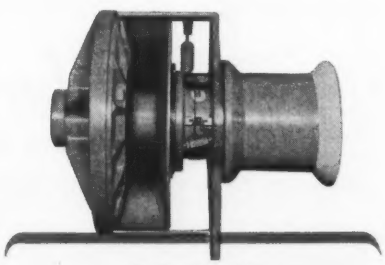

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Lysite area, Hot Springs County: Deep Rock Oil 1 Govt., SW NW SE 21-42n-90w, TD 3,075 ft., dry, Chugwater 1,385 ft., Embar 2,840 ft., Tensleep 3,045 ft.

MONTANA WILDCAT FAILURES

Wolf Creek, Carter County: Hunt Oil Co. 1 Govt., C SE SE 27-8s-57e, TD 1,036 ft., dry, strat test.

Alice Dome, Garfield County: Phillips Petroleum Co. 1 Alice Dome, C SE SE 9-13n-34e, TD 6,943 ft., Eagle 580 ft., first Cat Creek 2,620 ft., second Cat Creek 2,925 ft., third Cat Creek 2,990 ft., Morrison 3,070 ft., Ellis 3,195 ft., Amsden 3,660 ft., Kibbey 4,594 ft., Madison 5,460 ft., Cambrian 6,765 ft.

UTAH WILDCAT FAILURE

Vernal Unit, Uinta County: Vernal Dome Oil & Gas 1 fee, C NW SE 30-3s-21e (Lot 10), TD 2,264 ft., suspended.

APPALACHIAN FIELD

West Virginia Wells Produce Gas Yields

PITTSBURGH.—In Davis district, Tucker County, West Virginia, Cumberland & Allegheny Gas Co. 1-A-418 West Virginia Power & Transmission Co., elevation 3,296 ft., Oriskany sand 8,056 ft., is carrying 500,000 cu. ft. of gas struck at 8,129 ft., with drilling operations still in progress. In Elk district, Kanawha County, United Fuel Gas Co. 6415 W. J. Patterson resulted in gas gaging 9,282,000 cu. ft. natural in the Oriskany sand which was topped at 5,210 ft.; gas 5,220-31 ft.; total depth 5,232 ft. This company's 6414 W. J. Patterson resulted in 5,034,000 cu. ft. of gas natural—Oriskany sand 5,194 ft.; gas 5,201 ft.; total depth 5,215 ft. Its 6426 F. C. Major resulted in 5,512,000 cu. ft. of gas after shot—Oriskany sand 5,116 ft.; gas 5,131-47 ft; total depth 5,152 ft.

In Grant district, Ritchie County, Hope Natural Gas Co., Clinton test 9300 Jessie Powell, elevation 1,006 ft., reported the top of the Berea sand at 2,036 ft., and is drilling at 2,160 ft. A good gas well was reported in Grant district, Wayne County, by United Fuel Gas Co. 6369 fee, gaging 5,116,000 cu. ft. of gas natural in the Big lime; total depth 1,900 ft.

In Unity Township, Westmoreland County, Pennsylvania, Peoples Natural Gas Co. wildcat 3830 William Piper, elevation 2,061 ft., is drilling at 4,802 ft.; and in Derry Township this company's 3814 Camilla Giffin, elevation 2,238 ft., is drilling at 7,888 ft. In Wayne Township, Erie County, Pennsylvania Gas Co. 1 A. D. Peterson, which was drilled to the depth of 4,603 ft. with 74,000 cu. ft. of gas in the White Medina sand, will be plugged.

New locations in Pennsylvania were three: East Franklin Township, Armstrong County; Clarion Township, Clarion County; and Allegheny Township, Westmoreland County.

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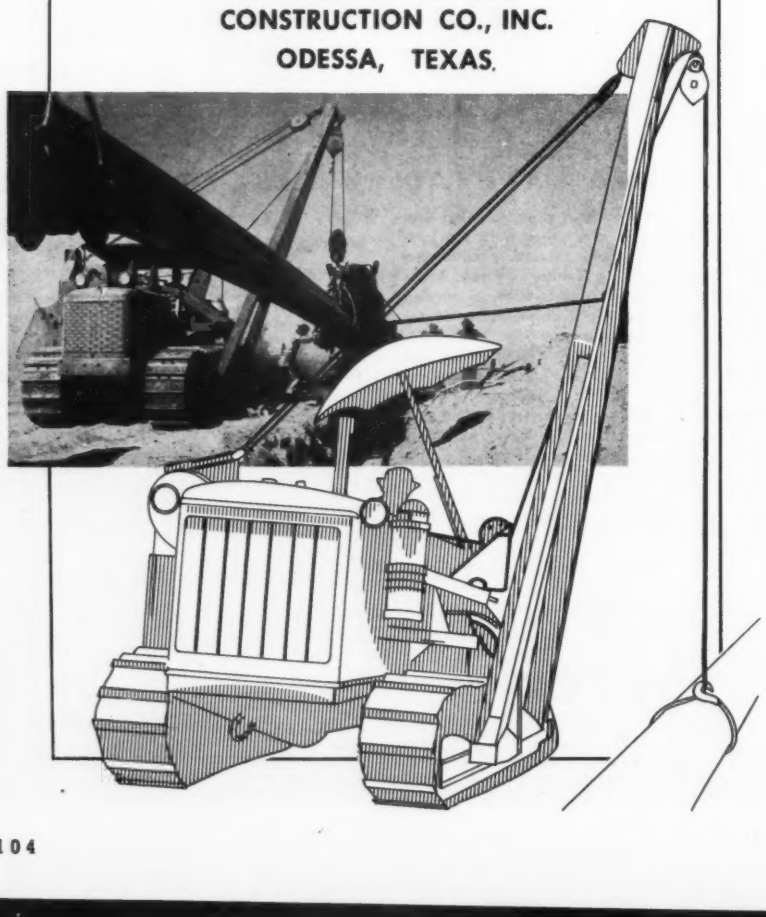

KANSAS

Barton County Wildcat Swabs 6 Bbl. Per Hour

BAY PETROLEUM CORP. continues testing at 1 Schartz, SW SW SE 7-20s-12w, Barton County, after swabbing at the rate of 6 bbl. per hour through perforations at 3,230-34 ft. The Lansing was topped at 3,172 ft. and the above swabbing was through perforations at 3,230-34 ft. after treatment with 1,000 gal. of acid. The Arbuckle was called at 3,423 ft. and hole carried to 3,433 ft. with casing set at 3,424 ft. Crew swabbed at the rate of 1 bbl. of oil and 1 bbl. of water from the lower formation before plugging back to the Lansing-Kansas City.

In the next township to the north, Mouser Drilling Co. has a show of oil at 1 Fransen, NW SE NW 6-20s-12w. A 30-minute drill-stem test of the Lansing at 3,179-89 ft. recovered 175 ft. of oil.

In southeastern Graham County, Derby Oil Co. and Peel Drilling Co. have an Arbuckle show at 1 Lewis, NE NE NW 23-10s-21w. A 30-minute drill-stem test at 3,777-81 ft. recovered 30 ft. of oil-cut mud. Casing has been set at 3,778 ft.

The area in southern Barton County within the triangle formed by West Marchand, Northwest Kowlsky, and Workman pools continues to be very active. Alpine Oil & Royalty Co. has completed a pool opener at 1 Bryant, NW SW NE 27-20s-12w, with a potential of 171 bbl. per day from the Arbuckle. The well is southwest of West Marchand pool. The same company has completed 1 Marchant, NW NW NW 26-20s-12w, between the Bryant well and the pool. To the south of the Bryant well and east of Workman pool, Adair 1 Steckel, NW NW SE 34-20s-12w, is swabbing about 50 bbl. per day from the Arbuckle.

Deep Rock Oil Corp. et al 1 Calbeck, SW SW NE 33-26s-13w, has been completed as an Arbuckle well with a potential of 50 bbl. per day to extend Chance pool of Pratt County by ½ mile to the north.

KANSAS SUCCESSFUL WILDCATS

Barton County: Alpine Oil & Royalty Co. 1 Bryant, NW SW NE 27-20s-12w, pumped 171 bbl. of oil per day from Arbuckle at 3,383-3,405 ft.; Heebner 3,009 ft., Lansing 3,151 ft., conglomerate 3,274 ft., TD 3,405 ft.

Johnson County: G. L. Smith 1 Pretz, SW SE NW 1-14s-22e, 500,000 cu. ft. of gas from Cherokee sand at 628-45 ft.; Mississippian 1,009 ft., Viola 1,450 ft., Wilcox 1,555 ft., TD 1,560 ft.

KANSAS WILDCAT FAILURES

Barton County: Ben Brack Oil Co. 1 State, SW SW NE 5-20s-13w, dry, TD 3,665 ft.,

anhydrite 722 ft., Lansing 3,207 ft., conglomerate 3,444 ft., Arbuckle 3,660 ft.

Cowley County: K. T. Weideman 1 Haworth, NW NW SW 7-30s-7e, dry, TD 2,912 ft., Kansas City 2,180 ft., Mississippian 2,887 ft.

Waubansee County: Amerada Petroleum Co. 1 L. Morton, SW SW NW 28-10s-10e, dry, TD 1,918 ft., strat test, no tops reported.

OHIO, KENTUCKY

Extension Test Gages Good Amount of Gas

COLUMBUS.—The National Gas 1 Esta Crabtree, Section 8, Perry Township, Licking County, a ½-mile extension, came in as a good gas well. The Clinton sand was topped at 2,999 ft. and drilled 32 ft. in where the gage showed 1,247,000 cu. ft. of gas natural with 850 psi. pressure.

In the Bladensburg pool, the Mid East Oil C. M. Darling, Section 14, Jackson Township, Knox County, made 125 bbl. the first day after shot. Clinton sand at 2,869-2,916 ft. had a good oil showing natural.

The Preston Oil 1 Charles Stemm, Section 9, Salt Creek Township, Muskingum County, made only a disappointing 25 bbl. after shot. The Medina at 4,144-51 ft. had an unusually good showing natural with 2,000 ft. of oil in the hole.

The Ohio Fuel 2 E. L. Pierce, Lot 10, Penfield Township, Lorain County, probably will open another small gas pool. Clinton at 2,438-56 ft. gaged 325,000 cu. ft. of gas natural, and 410,000 cu. ft. with 1,125 psi. pressure after shot.

Freuhauf Trailer Co. 1 A. Klingshorn, Section 8, Avon Township, Lorain County, came in as a small oil well which may be plugged. The oil was from a stray Clinton at 2,218-29 ft. The test was a wildcat to find gas for their own plant.

WESTERN KENTUCKY

OWENSBORO.—Ashland Oil & Refining Co. and Basin Drilling Co. have completed the second well in North Euterpe pool in Henderson County. The new well, 2 C. M. Crafton, 1-O-25, was completed in the Hardinsburg at 1,734-39 ft. with an initial production of 42 bbl. per day. The third well in the section, 3 Crafton, NE SW SE of the same section, was dry at 2,385 ft.

In the area northeast of Birk City field in Daviess County, F. M. Ashby has a good prospective shallow producer at 1 St. Peter Catholic Church Land, 5-P-28, just east of Stanley, Ky. The well is reported to be making about 5 bbl. per hour from Palestine sand at 973-74 ft. The Palestine is also productive in parts of Birk City field.

In the northwest part of Griffiths pool, J. C. Ellis 1 Fee, 7-P-28, has been completed in the Palestine with an estimated initial production of 50 bbl. per day. The pay sand is at 981-82 ft.

EASTERN KENTUCKY

ASHLAND.—In western Powell County and located in 23-P-67, Arch Carpenter and California Co. are drilling below 3,000 ft. on 1 James Hall wildcat 7 miles northwest of the Furnace gas field. No information is being released on this test although it is probable that operators are now several hundred feet in Knox dolomite formation. In the same general area, same operators are drilling at 2,500 ft. on 1 Pete Wells located in 23-P-67, wildcat in northern Estill County.

In southern Fleming County, Walter Kline et al 1 James Bashford, 20-V-70, is drilling at 1,125 ft. on the way to test the Knox dolomite. Several miles to the northeast of this test, Edward Lillie et al was drilling at 2,035 ft. in Knox dolomite topped at 1,590 ft. Operators are drilling with hole full of water.

INDIANA

EVANSVILLE.—In the southwestern part of Posey County east of College pool, Carter Oil Co. has completed 1 Olive Hastings, SE SE NE 11-8s-14w, with an initial flowing production of 672 bbl. per day from the McClosky at 2,860-66 ft. Carter 2 Hastings, SE NE NE of the same section, ran a drill-stem test on the McClosky at 2,861-81 ft. with tool open for 3¾ hours. Gas appeared in 11 minutes and recovery was 1,740 ft. of oil. Operator is running casing for further tests. This area opened in November by V. R. Gallagher et al 1 Spencer-Vogel, NW SW NW 12-8s-14w.

The Vanderburgh County outpost, W. O. Morgan 1 Walter Boeke, NW NW SE 6-6s-11w, northwest of Evansville and about ¾ mile southwest of South Vienna pool, is testing the O'Hara at 2,602-09 ft. The well is reported to be swabbing about 13 bbl. of oil per hour. Casing was set at 2,584 ft.

In Vigo County, Kuykendall Drilling Co. has set casing at 1 H. McIntosh, NW NW SW 24-11n-8w, to 1,719 ft. for a test of the Devonian. The well is southeast of the abandoned Riley pool.

INDIANA WILDCAT FAILURES

Gibson County: Paul Maier 1 W. A. Owen, NE SW SW 29-3s-12w, dry, TD 2,808 ft.

Posey County: F. J. Fleming and Aurora Gasoline Co. 1 R. Morris, NE SW SW 31-4s-13w, dry, TD 3,054 ft.

Vigo County: C. B. Mansfield 1 Prox, NE NE SE 6-11n-8w, dry, TD 1,816 ft.

W. McGill et al 1 A. Kleptz, NW SW NW 13-11n-9w, dry, TD 1,822 ft.

T. P. Smith 1 A. E. Cox, NW NE SW 21-11n-9w, dry, TD 1,878 ft.

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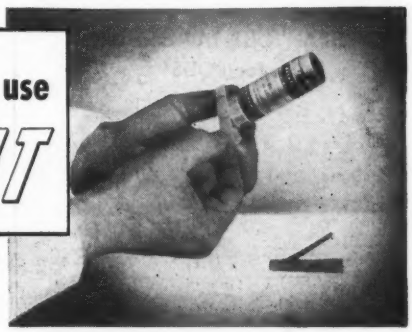

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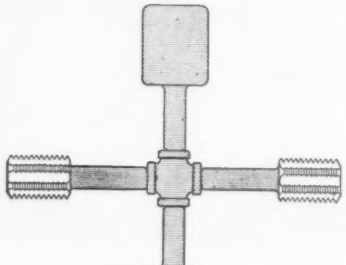

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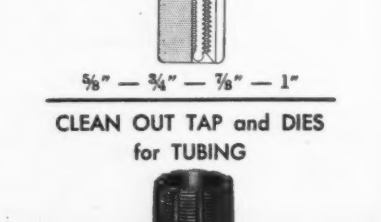

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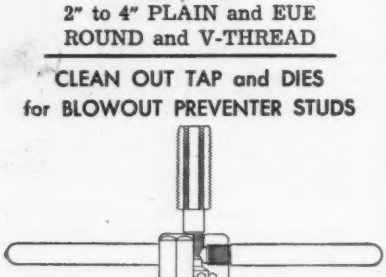

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BAIRD MFG. CO.—TULSA

CALIFORNIA

New Oil Discovery Made In Kern's Gosford Area

LOS ANGELES.—After some difficulty in getting a successful water shutoff, Hancock Oil Co. has completed its wildcat venture in the Gosford area of Kern County as a new oil discovery. The well, 85-23 Kern County Land Co., 23-30s-26e, came in flowing early last week at a rate of 500 bbl. daily from the Stevens sand at a depth of 7,835-54 ft. While not much sand body was encountered in this well, operators are hopeful that thicker sections will be found elsewhere in the area. Total depth of the well is 8,473 ft.

Latest reports at the close of the week indicated that the discovery had settled down to a steady flow of 261 bbl. daily through an 11/64-in. choke. Gravity of the oil was reported to be 34.2°. Gas yield was gaged at 183,000 cu. ft. daily.

Hancock originally tested the well several weeks ago and obtained a good flow of oil from the interval 7,814-8,050 ft. After a few hours, however, production turned to all water and the perforations were squeezed. A second set of perforations was made at 8,075-89 ft., but formation tests recovered only salt water with traces of oil from the interval. Operators then squeezed these perforations and went back to the shallower zone from which the well is now producing.

The 85-23 Kern County Land Co. is located about 2½ miles northeast of the Ten Section field which also produces from the Stevens sand. Hancock holds approximately 1,860 acres of leases surrounding the discovery well and plans to continue with a fairly rapid development campaign if the field proves to be as good as is believed. Location for a followup well already has been staked 660 ft. north of the discovery.

Standard Oil Co. of California has topped the objective Eocene sand in its deep wildcat venture in Greeley field of Kern County. Scout reports late last week indicated that the first Eocene cores taken at the 12-21 Kern County Land Co., 7-29s-26e, were cut at a depth of 13,349-55 ft. and contained sand that appeared to be saturated with oil. While oil saturation in the top of the Eocene sand section does not mean that commercial production will be developed it does lend considerable encouragement to the venture. A commercial discovery in the Eocene at Greeley quite possibly would be a major importance since very prolific production would have to be developed in order to make a well commercial at the depth at which Standard is now drilling.

R. W. Sherman has not yet been able to place his prospective oil discovery in the Newhall area of Los Angeles County back on production. His 3-1 Newhall Community, 2-3n-16w, created considerable excitement 2 weeks ago when it came in flowing oil at a high rate. Water trouble developed within a short time, however, and operators have not been able to clean this up as yet. The well, drilled to a total depth of 5,846 ft., has been squeezed and reperforated. Currently, portable equipment is being used to swab the hole, but field reports indicate that a little light oil and mud is about all that is being brought up by the swab.

CALIFORNIA SUCCESSFUL WILDCAT

Santa Barbara County, Casmalia area: Union Oil Co. A-4 Escolle, 28-9n-34w, pumped 7 bbl. daily, gravity 20.6°, water cut 67 per cent, elev. 754 ft., perf. 2,697-3,196 ft., TD 3,330 ft.

CALIFORNIA WILDCAT FAILURES

Los Angeles County, Dominguez area: Standard Oil Co. of Calif. 1 Del Amo, 5-4s-13w, dry, elev. 21 ft., TD 10,251 ft.

Santa Barbara County, Refugio area: The Texas Co. 1 Johnson, 26-5n-31w, dry, elev. 540 ft., TD 3,989 ft.

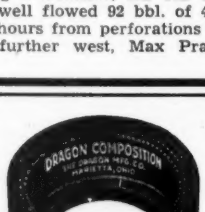
Tulare County, Corcoran area: Pacific Western Oil Corp. 1 Green Cattle Co., 33-21s-23e, dry, elev. 206 ft., TD 9,050 ft.

OKLAHOMA

The Golden Trend Area Has Increased Activity

ANOTHER possible pool opener for the Golden Trend area of Garvin County came last week with distillate recovery at Davon Oil Co. 1 Layton, SE SW SE 36-3n-3w. A drill-stem test of sand at 7,210-33 ft. had gas in 7 minutes and distillate in 10 minutes. Gas was estimated at 10,000,000 cu. ft. per day. The well is southwest of Southwest Antioch pool.

The areas just west of Southwest Antioch and Southwest Maysville are very active. The California Co. continues testing at 1 Graham, NE NE SW 36-4n-3w, after flowing 219 bbl. of 43°-gravity oil in 23 hours through ¼-in. choke. To the west of Southwest Maysville, The Texas Co. is completing 1 Donham, NE NE NW 22-4n-3w. The well flowed 92 bbl. of 46°-gravity oil in 24 hours from perforations at 6,773-85 ft. Still further west, Max Pray and E.



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Walker had a good Deese show at 1 Pratt, NE NE SE 20-4n-3w.

In the southeastern part of Lincoln County, J. M. Huber Corp. has found Wilcox production after deepening a former dry hole. The well, 1 Tierney, NE NE NW 30-12n-6e, was originally drilled to 4,202 ft. Operator deepened, topping the Wilcox at 4,700 ft., and ran a drill-stem test at 4,697-4,711 ft. Gas showed in 30 minutes and the well flowed oil as the crew broke down the drill pipe. Recovery was 800 ft. of oil.

In the southern part of Carter County between Brock and West Brock pools, Mid-Continent Petroleum Corp. continues testing at 1 Wesley, SW SW SE 13-5s-1w. The well which flowed oil and water at 4,490-4,502 ft. was plugged back and perforated at 4,217-27 ft. to flow 150 bbl. of oil in 14 hours through casing. Later, 24-hour test gages have shown 97 bbl., 95 bbl., and 81 bbl.

Earl Sadler has a possible pool opener at 1 Gaddy, NW NW SE 21-10n-2e, north of Shawnee Lake pool in Pottawatomie County. The well was drilled to 6,078 ft. and casing set 2 ft. off bottom. Pipe was perforated at 5,985-98 ft. in the first Wilcox for a flow of oil that was estimated at 50 bbl. per hour.

OKLAHOMA SUCCESSFUL WILDCAT

Caddo County: Denver 1 School Land A, C SE SW 16-10n-9w, 5,000,000 cu. ft. of gas from lower Dornick Hills at 12,600-60 ft., TD 17,094 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Harper 1 Turner, NW NW SW 18-1s-9w, dry, TD 2,585 ft., no tops reported.

Richardson 1 Ray, SW SW SW 14-3s-11w, dry, TD 2,146 ft., no tops reported.

Garvin County: Carlock 1 Grant, NW NW SW 21-1n-1e, dry, TD 4,005 ft., limy sand 1,220-50 ft., sands 1,380-90 ft., 1,434-43 ft., 1,453-57 ft., 1,715-21 ft., 2,067-71 ft., 2,087-98 ft., 2,156-67 ft., 2,490-2,510 ft., 2,886-93 ft., and 3,340-50 ft., all dry.

Hughes County: Hall 1 Henthorne, NW SE NW 18-7n-11e, dry, TD 2,080 ft., no tops reported.

Clark 1 First National Bank, SE NE SE 22-7n-8e, dry, TD 2,744 ft., no tops reported.

Kay County: Elson 1 Claybaker, SE SW SE 5-27n-1e, dry, 3,765 ft., lime 3,620 ft., Burbank sand 3,674-97 ft., Mississippi chat 3,734 ft., Mississippi lime 3,762 ft.

Lincoln County: Gulf 1 Lonnie, NE SW SE 24-12n-6e, dry, TD 4,608 ft., no tops reported.

Delaney 1 Guild, NE NE NE 23-13n-5e, dry, TD 3,520 ft., Oswego 1,330 ft., Prue 3,350 ft., Verdigris 3,494 ft.

Hubbell 1 Stein, SW SW SE 33-14n-2e, dry, TD 5,496 ft., Hogshooter 3,575 ft., Checkerboard 3,896 ft., conglomerate 3,916-24 ft., Oswego 4,490 ft., Prue 4,558 ft., Prue sand 4,578 ft., Skinner sand 4,764-81 ft., Red Fork 4,870 ft., Hunton 5,165 ft., Sylvan 5,206 ft., Viola 5,312 ft., Wilcox 5,407 ft., second Wilcox 5,479 ft.

Okfuskee County: Lynn 1 Self, NW NW SE 14-13n-10e, dry, TD 3,462 ft., Bartlesville 2,120-2,240 ft., Dutcher 2,649-62 ft., Wapanucka lime 2,765 ft., Mayes 3,090 ft., Woodford 3,275 ft., Hunton 3,298 ft., Sylvan 3,304 ft., Viola 3,385 ft., dense 3,405 ft., Wilcox 3,430-45 ft., second Wilcox 3,455 ft.

Mid-Continent 1 Malloy, SE SE NW 26-13n-10e, dry, TD 2,791 ft., Wapanucka-Cromwell 2,762 ft.

Oklahoma County: Westcott 1 Ragsdale, SW SE SE 28-13n-1e, dry, TD 4,852 ft., no tops reported.

Payne County: Zephyr Drilling 1 State B, SE NW NE 36-19n-1e, dry, TD 4,932 ft., Oswego 4,020 ft., Mississippi lime 4,522 ft., Hunton 4,675 ft., Sylvan 4,722 ft., Viola 4,802 ft., Wilcox 4,870 ft., second Wilcox 4,924 ft.

ILLINOIS

Berryville Pool Gets South Extension

MATTOON.—Berryville pool in the northwestern part of Wabash County has a south extension that flowed oil at the rate of about 410 bbl. per day from the McClosky. The well, V-T Drilling Co. and C. P. Chandler et al 1 Flora Blakney, C S½ S½ SE 35-2n-14w, was drilled to a depth of 2,903 ft. and is flowing from pay at 2,897-2,903 ft. The well is a ¼-mile south extension to Berryville pool, an area that was not very active during the summer months of the year. In January, Phillips Petroleum Co. completed 2 T. L. Smith, S½ NE SE 35-2n-14w, on the south edge of the pool, for an initial production of 560 bbl. per day flowing from the McClosky. V-T Drilling Co. et al 2 Blakney, between the 1 Blakney and the Phillips 2 Smith, has casing on the McClosky at 2,903 ft.

In Wayne County, Gulf Refining Co. 1 W. S. Rush, NE NE NE 35-2n-5e, is pump testing the McClosky at 2,964-68 ft. The well flowed 1 bbl. of oil per hour natural.

George C. Schoonmaker 1 Pemberton-Parks, SE SE SW 33-7s-7e, Saline County, is cleaning out after reshooting the Tar Springs with 195 qt. The pay sand is at 2,280-89 ft.

In Hamilton County, Ross Bartmess has completed 1 Whipple, NW NW SW 23-35-5e, a north extension for Dahlgren pool, with an initial production of 144 bbl. per day from the McClosky at 3,292-3,304 ft. after a 6,000-gal. acid treatment.

ILLINOIS SUCCESSFUL WILDCATS

Hamilton County: Ross Bartmess 1 W. Whipple, NW NW SW 23-3s-5e, IP 144

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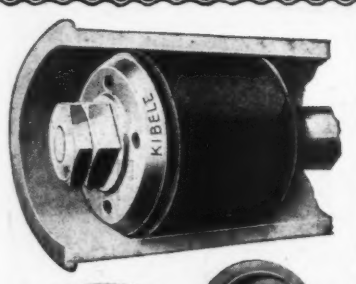
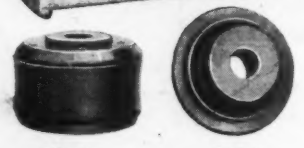
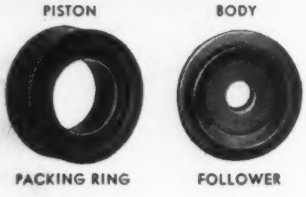




PISTON BODY



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EQUIPMENT ENGINEERS, INC.
2039 AMELIA St.,
DALLAS, TEXAS

bbl., McClosky 3,292-3,304 ft., TD 3,382 ft.

Perry County: National Associated Petroleum Co. 1 J. A. Ernest, C N½ NE NE 23-4s-4w, IP 23 bbl., Trenton 3,623-85 ft., TD 3,735 ft.

ILLINOIS WILDCAT FAILURES

Clay County: Sohio Petroleum Co. 1 N. O. Densmore, NW NW SW 15-4n-8e, dry, TD 3,133 ft.

Edwards County: Sohio Petroleum Co. 1 R. Reid, NW NW NW 20-1n-14w, dry, TD 3,212 ft.

Hamilton County: C. E. O'Neal et al 1 A. H. Simpson, NE NW NW 32-4s-7e, dry, TD 3,576 ft.

Jasper County: J. J. Lynn 1 W. Spough, SW SW SW 31-8n-10e, dry, TD 3,777 ft. J. J. Lynn 1 J. H. Wyatt, SW SW NE, 6-7n-10e, dry, TD 2,799 ft.

Marion County: W. R. Murphy et al 1 Kell, SE SW SW 32-1n-3e, dry, TD 2,622 ft.

Madison County: A. E. DeFratis 1 Albrecht, SE SW SE 25-6n-7w, dry, TD 635 ft.

Monroe County: George Zecos 1 H. Symons, SE SW NE 33-3s-11w, dry, TD 1,352 ft.

Richland County: J. W. Everhart 1 Slichenmeyer, SW NE NW 21-3n-10e, dry, TD 3,217 ft.

CANADIAN FIELDS

Redwater Gets Third Success

CALGARY.—With the confirmation of success at a third well, Redwater became an oil field. The new success, Imperial- Redwater No. 3, LSD 9, 11-57-21w4, coupled with the geophysical picture, indicates that the coral reef core of oil-bearing structure extends for at least 10 miles in a northwest-southeast line. The drill has still to finally determine the ultimate length and width of the structure, but Imperial Oil's third success has confirmed that an oil reserve far larger than any other yet found in Canada is in the making.

Two drill-stem tests have been run to date. The first test was run at bottom 3,160 ft. and gave a 300-ft. rise of water-free crude oil in 1 hour. The second test at 3,205 ft. gave a flow of oil to the surface in 50 minutes. The well was allowed to flow for 5 minutes before valve was closed. Currently Redwater No. 3 is coring ahead from 3,205 ft., and will drill-stem test at short intervals until the water line is reached.

The new success logged top of the coral reef limestone around 3,155 ft., a level which indicates that about 120 ft. of pay zone probably exists above the water line. Imperial No. 1 discovery well, LSD 1, 32-57-21w4, located about 5 miles northwest of No. 3, logged higher, and obtained an oil zone of about 145 ft. in thickness. Imperial No. 4, LSD 3, 14-58-22w4, the field's second success, located about 5 miles further northwest, is the lowest logging to date. It obtained about 80 ft. of pay above the water line. One failure has resulted in the field so far: Imperial No. 2, LSD 3, 29-58-21w4, 5 miles due north of No. 1, which did not find the reef present.

Aldersyde.—Pan-Ranchmen's No. 1, near Aldersyde, about 23 miles southwest of Calgary, ran drill-stem test after coring through some oil-bearing Fernie sand to reach top of the Madison limestone about 7,279 ft. The test gave a small natural gas flow rate of 40,000 cu. ft. daily, plus a 65-ft. rise of drilling mud and light green crude oil of around 40° gravity. At last report, crew was going back into hole to continue coring. Further drill-stem testing will follow as showings warrant. Pan-Ranchmen's is located in LSD 5, 17-20-28w4.

Stettler.—A highly promising natural gas discovery in the lower Cretaceous was made by the Piccadilly-Interleduc-Edwards No. 1 wildcat southwest of the town of Stettler. In a drill-stem test of interval at 4,358-77 ft. there was an immediate blow of gas, with flow estimated at 6,000,000 cu. ft. daily. Flowing pressure was 950 psi. The valve was closed after 20 minutes. Closed-in pressure built up to 1,200 psi. Crew is currently coring at 4,428 ft. for test of basal Cretaceous and its main objectives in the Devonian. The Stettler well, located in LSD 13, 14-38-21w4, is the first to have important showings of natural gas in the general Stettler area.

Tawatinaw.—Canadian Basin Oil Co., unit of the Canadian Gulf Oil Co., is going to drill immediately on a seismograph anomaly in the Tawatinaw area 50 miles north of Edmonton. Canadian Gulf is the principal operating medium in Alberta of Gulf Oil Corp. of Pittsburgh. The well, Canadian Basin John Onucki No. 1, LSD 7, 31-61-24w4, is the company's first venture since its organization some months ago. Situated around 26 miles northwest of Imperial Redwater No. 4, the nearest oil success, the new test is currently rigging up prior to spudding. Main objective at the initial venture will be the Devonian formation that yielded Redwater and Leduc production.

LA.-ARK.

East Haynesville Gets First Smackover Well

SHREVEPORT.—Hunt Oil Co. 1 A. O. Goodwin, 21-23n-7w, which was delayed about 3 weeks awaiting workover rig to reset leaking packer, completed this week to become the first Smackover producer in the East Haynesville field. Smackover is the regular pay in the Haynesville field, but the eastern area produces from the Glen Rose and lower Pettit. Details were not available, but initial potential was 360 bbl. of distillate a day through 12/64-in. choke, from perforations at 10,160-170 ft. Corrected location of the new well is about 1 mile southwest from nearest production in the eastern area; previous reports carried it as a southeast extension of the field.

Between the Sugar Creek and Lisbon fields, Claiborne Parish, H. W. Klein 1 A. H. Sims, 34-20n-5w, was drilling in the Travis Peak below 5,820 ft. Top of the formation was not reported. Cores from 5,717-5,803 ft. recovered limy shale with no shows.

The Saline Bayou field (Wilcox), received its fourth producer this week at Hunt Oil Co. 4 Louisiana Delta Lumber Co., SE NE 1-4n-4e, which flowed 222 bbl. of 47°-gravity oil a day on 10/64-in. choke from perforations at 5,510-16 ft. Pressures were 780 psi. on tubing and 830 psi. on casing, and gas-oil ratio was 545 cu. ft. There are six dry holes in the area.

Barnsdall Oil Co. 1 Robert Sykes, 1-22n-9w, Webster Parish, prepared to test the Pettit zone, on the basis of 12 side-wall cores at 9,584 and 9,565 ft., which had shows of oil. Total depth was 11,592 ft., in the Smackover.

Stanolind Oil & Gas Co. and Continental Oil Co. 1 Viola Mitchell Unit, 31-23n-9w, Webster Parish, completed as a Cotton Valley discovery in the shallow Shongaloo area. Potential was 312 bbl. of distillate a day on ¼-in. choke, from perforations at 10,327-333 and 10,308-320 ft. Tubing pressure was 2,900 psi. Total depth was 11,295 ft., in the Smackover, plugged back to 10,505 ft.

NORTH LOUISIANA SUCCESSFUL WILDCATS

Claiborne Parish: Hunt Oil Co. 1 A. O. Goodwin, SW SW 21-23n-7w, new pay, East Haynesville field, perforated Smackover 10,160-170 ft., flowed 360 bbl. 56.4°-gravity distillate in 24 hours, 12/64-in. choke, tubing pressure 4,000 psi., GOR 6,000 cu. ft., elev. 270 ft.

Webster Parish: Stanolind Oil & Gas Co. 1 Viola Mitchell Unit, NE SE 31-23n-9w, new pay, Shongaloo area, perforated Mitchell sand in Cotton Valley 10,308-20, 10,327-33 ft., flowed 312 bbl. 57.1°-gravity distillate a day, ¼-in. choke, tubing pressure 2,900 psi., GOR 7,340, TD 11,295 ft., PB 10,505 ft., elev. 223 ft.

NORTH LOUISIANA WILDCAT FAILURES

Bossier Parish: N. V. Kinsey 1 C. A. Antrim, 30-22n-11w, dry, TD 3,170 ft., Midway 1,030 ft., Arkadelphia 1,620 ft., Nacatoch 1,758 ft., sand 1,836 ft., Saratoga 2,159 ft., Tokio 2,940 ft., elev. 228 ft.

Union Parish: J. A. Carraras 1 T. W. Auger, 36-23n-1w, dry, TD 2,205 ft.

ARKANSAS WILDCAT FAILURES

Lafayette County: Palmer Oil Corp. 1 J. A. Thomas, NW SE NE 15-16s-23w, dry, TD 4,007 ft.

Stanolind Oil & Gas Co. 1 Union Saw Mill, NW NW 18-19s-24w, dry, TD 11,440 ft., no tops reported.

Nevada County: Carter Oil Co. 1 W. T. Dewoody, NE NE SW 20-11s-20w, dry, TD 2,214 ft. in Smackover (?), core test.

Ouachita County: Garland Anthony 1 Henry Hirsch, N/2 NE SW 8-12s-18w, dry, TD 3,330 ft.

PERMIAN BASIN

Two New Discoveries Made in Upton County

MIDLAND. — Exploration interest swung back to Upton County this week, which had an assured Pennsylvanian strike some 7 miles north and west of the 1 Alford, and a new pay discovery in Benedum field.

The Pennsylvanian discovery in Richardson & Bass 1 Neal Bros., 660 ft. from north and 1,980 ft. from east lines of Section 9, Block Y, GC&SF Survey. Early in the week the well began flowing after the swab was run, following acid treatment of 2,500 gal. through perforations at 10,700-30, 10,760-80, and 10,800-20 ft. It flowed into pits for 3½ hours, then gaged 27.6 bbl. of oil the first hour to storage, through ½-in. choke. The choke was reduced to ¼-in. and it averaged 22½ bbl. an hour for the next 2 hours. Total oil produced in 19 hours was 169 bbl. The last hour's flow was 9 bbl. of oil, at which time the flow died. Drilling mud in the tubing apparently killed the flow. When swabbing was resumed, the well kicked off again and flowed 43 bbl. of oil in 2 hours, through open tubing. Gas-oil ratio was 2,150 cu. ft. Operators were to reacidize with 500 gal. through the same set of perforations.

The 1 Neal was drilled to 12,543 ft., but had no shows of oil or gas in the Ellenburger. On an elevation of 2,726 ft., it topped the Devonian at 11,345 ft., the Silurian at 11,943 ft., the Fusselman section at 11,960 ft., and the Ellenburger at 12,463 ft. Location is 3¾ miles north of Fred Turner, Jr., 1 Barnett, Pennsylvanian discovery for the area, which is 3¼ miles northwest of the Benedum Ellenburger discovery.

The new pay discovery for Benedum is Slick-Urschel 1-B Gordon, SE NW Section 47, Block Y, TCRR Survey, ½ mile north of the same company's 1 Gordon, a completed Ellenburger producer ¾ mile northwest of the 1 Alford. The 1-B Gordon ran a 1-hour drill-stem test of the Fusselman section at 10,910-90 ft., using 1,000 ft. of water cushion. The water started flowing at the surface in 10 minutes, followed by dry gas in 15 minutes and flowing oil in 35 minutes. Total oil recovered was not gaged, but operators estimated the flow of oil at 10-20 bbl. an hour. Gravity of the oil or distillate was 57.6°. Drilling continued below 11,052 ft. after the test.

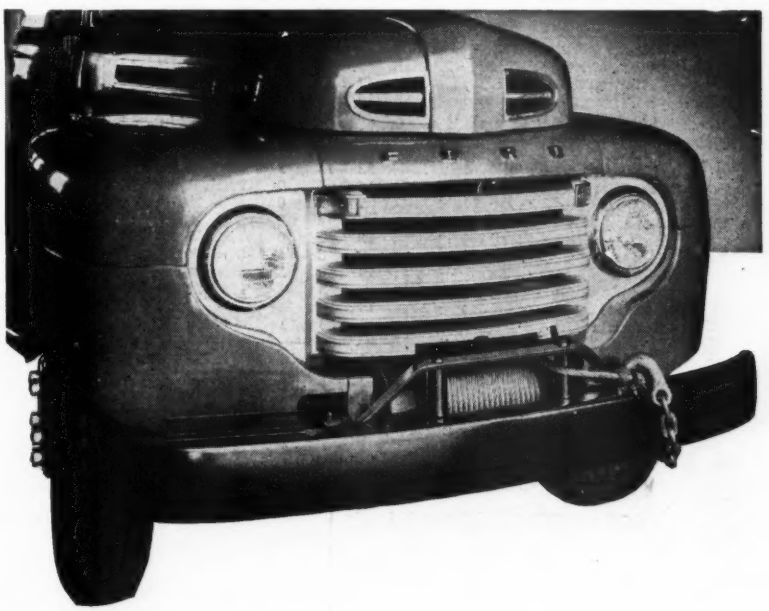
Wilshire Oil Co., Inc., completed its western Upton County Wolfcamp discovery for a pumping potential of 227 bbl. of oil a day, based on an 18-hour pumping test which produced 170 bbl. of oil. The well is 23-148 McElroy ranch, 5 miles east of shallow production in McElroy field. The wildcat had water in the Ellenburger, topped at 13,860 ft., then plugging back to 8,005 ft. for completion. Wilshire 42-135 McElroy ranch, Section 135, Block E. CCSDRGNG Survey, an old wildcat being deepened, was drilling new hole below 7,304 ft. in lime and shale. It is 1½ miles east and slightly north of the 23-148 well.

Placid Oil Co. 1 Davis, Scurry County wildcat 6½ miles north and slightly east of Snyder, apparently had found another section of the Pennsylvanian capable of commercial production. A drill-stem test in the Strawn lime at 7,384-7,405 ft., open 1 hour and 45 minutes, recovered 165 ft. of high-gravity clean oil, cutting 1 per cent water having very little salt content. After the test it drilled ahead toward its projected depth of around 7,700 ft. to explore the Ellenburger. Last week the well recovered free oil on a drill-stem test from 7,020-7,178 ft. According to reports, the section from 7,398-7,405 ft. showed no signs of oil or gas in the drill samples.

Magnolia Petroleum Co. 1-A TXL, northwestern Upton County wildcat, prepared to drill ahead 50 ft. for another test, after recovering oil on its fifth consecutive drill-stem test in the Ellenburger. On the last test, from 12,694-12,735 ft., gas came to the surface in 73 minutes, making an estimated 20,000 cu. ft. daily, and recovery was 1,180 ft. of water blanket, 820 ft. of heavily oil and gas-cut water blanket, 1,000 ft. of clean oil, and 365 ft. of heavily oil and gas-cut mud. Oil tested 53°-gravity, at 60° F. Open flowing bottom-hole pressure ranged from 1,200-1,300 psi. Shut-in pressure was 5,600 psi. in 15 minutes.

Tom Green County's first flowing oil well completed this week for a natural daily flowing potential of 363.12 bbl. of 36.2°-gravity oil, based on a 227-bbl. flow in 15 hours through ½-in. tubing choke

(Continued on page 120)



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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 18, 1948

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1948				
	Comp.	Oil	Gas	Dry	Footage	1948	1947	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	22	11	0	*11	21,931	1,431	1,711	0	0	0	0	0	0	0	0	0	0
Pennsylvania	43	19	6	†18	73,804	2,453	3,060	0	0	0	0	0	0	0	9	14	23
West Virginia	17	0	12	5	60,320	802	849	0	0	0	0	0	3	0	37	43	83
Ohio	30	7	9	‡14	66,323	1,362	1,339	0	0	0	0	0	2	0	11	36	49
Indiana	30	16	1	13	59,649	1,089	634	0	0	0	5	5	28	0	1	103	132
Kentucky	19	7	8	4	48,600	774	728	0	0	0	0	0	10	0	0	41	51
Illinois	46	19	0	27	126,125	2,441	2,043	2	0	0	9	11	49	0	2	375	426
Michigan	22	15	0	7	52,526	860	884	2	0	0	5	7	21	0	10	261	292
Kansas	64	43	4	17	211,907	3,060	2,642	1	0	1	3	5	62	0	8	425	495
Neb., Mo., Iowa	0	0	0	0	0	9	5	0	0	0	0	0	0	0	0	7	7
Oklahoma	78	42	4	32	261,538	4,080	3,921	0	0	1	13	14	126	8	29	611	774
Texas	277	177	6	94	1,105,908	11,767	8,978	7	2	0	45	54	325	37	100	2,008	2,470
North Central (Dist. 7-B & 9)	103	55	2	‡46	289,589	3,705	2,785	6	0	0	16	22	121	3	13	732	869
West (Dist. 7-C & 8)	58	50	0	8	282,071	3,118	2,201	0	0	0	4	4	66	1	6	229	302
Panhandle (Dist. 10)	17	15	2	0	52,727	642	471	0	0	0	0	0	1	0	3	11	15
Eastern (Dist. 5 & 6)	15	9	1	5	77,658	597	564	0	0	0	3	3	12	2	1	120	135
Gulf Coast (Dist. 2 & 3)	38	20	0	18	231,276	1,833	1,522	1	2	0	9	12	73	26	37	424	560
Southwest (Dist. 1 & 4)	46	28	1	17	172,587	1,872	1,435	0	0	0	13	13	52	5	40	492	589
Louisiana	38	23	1	14	216,246	2,255	1,585	2	2	0	5	9	50	28	9	215	302
Northern	22	16	1	5	70,196	1,504	945	0	2	0	2	4	4	6	2	104	116
Southern	16	7	0	9	146,050	751	640	2	0	0	3	5	46	22	7	111	186
Arkansas	7	1	0	6	29,311	302	321	0	0	0	4	4	6	0	0	94	100
Mississippi	7	4	0	3	44,738	410	478	0	0	0	2	2	4	2	3	101	110
Southeastern States	2	1	0	1	5,608	53	63	0	0	0	1	1	0	0	0	48	48
Montana	7	3	1	3	20,752	308	302	0	0	0	2	2	5	0	0	28	33
Wyoming	16	10	1	5	61,087	571	256	0	0	0	2	2	26	0	2	76	104
Colorado-Utah	4	3	0	1	21,213	215	205	0	0	0	1	1	3	0	5	46	54
New Mexico	15	10	2	3	55,704	581	531	0	0	0	3	3	5	1	3	57	66
California	43	38	1	4	151,778	2,772	1,985	1	0	0	3	4	116	1	5	338	460
Total United States	787	449	56	282	2,695,068	37,595	32,520	15	4	2	103	124	841	77	234	4,927	6,079
Total previous week	833	461	63	309	2,975,195	36,808	31,851	15	3	4	105	127	826	73	232	4,824	5,955
Total December 20, 1947	669	352	61	256	2,319,663			17	0	7	102	126	675	88	222	4,043	5,028

Service wells included: *11, †18, ‡3.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$2.17	....	....	....
19-19.9	2.19	....	....	....
20-20.9	2.21	$2.25	....	$2.12
21-21.9	2.23	2.27	....	2.14
22-22.9	2.27	2.29	....	2.16
23-23.9	2.30	2.31	....	2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point. †Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. (For detailed price changes in all fields see The Oil and Gas Journal, January 1, 1948, page 107.)

A.P.I. REFINERY REPORT, WEEK ENDED DECEMBER 11

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	852	2,414	283	1,307	1,656	22,629	10,877	26,410	12,635
Appalachian:									
District 1	102	292	49	118	80	2,503	419	994	427
District 2	68	238	22	62	86	1,193	125	283	229
Ind., Ill., Ky.	940	3,414	455	1,012	1,114	19,943	4,629	12,559	5,718
Okla., Kans., Mo.	423	1,657	178	420	494	9,168	1,409	5,945	2,925
Inland Texas	228	1,123	86	163	392	3,584	642	915	1,213
Texas Gulf Coast	1,448	4,402	739	2,369	1,825	16,114	3,398	13,932	11,153
La. Gulf Coast	451	1,393	440	695	522	5,355	2,383	4,108	3,765
N. La. and Ark.	87	242	62	73	124	2,686	471	757	314
Rocky Mountain:									
New Mexico	14	51	7	12	27	68	25	46	32
Other Rocky Mtn.	143	481	40	183	196	2,095	240	1,640	1,130
California	894	2,688	145	1,139	2,430	11,772	894	14,817	46,865
Dec. 11, 1948	5,650	18,395	2,506	7,553	8,946	97,110	25,512	82,406	86,406
Dec. 4, 1948	5,698	18,216	2,490	7,269	8,897	95,235	26,537	83,993	86,381
Dec. 13, 1947	5,104	15,705	2,485	6,337	8,580	87,608	18,127	55,032	53,318

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 237,735,000 bbl. as of December 11—up 3,803,000 bbl. One year ago 223,474,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas*	$2.65
Kettleman Hills, California*	2.14
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	4.50
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

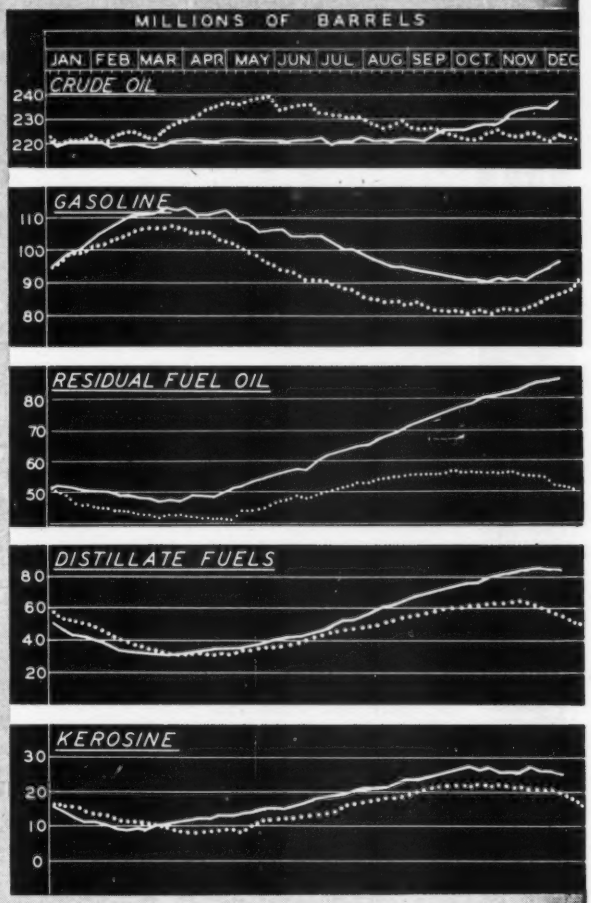
DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 18 crude oil	B. of M. Dec. demand	Dec. 11 crude oil
Alabama	1,150	1,700	1,250
Arkansas	81,400	88,000	81,700
California	955,300	960,000	955,000
Colorado	*53,510	50,000	52,290
Eastern	61,800	65,500	62,000
Florida	850	1,100	875
Illinois	181,100	168,000	178,400
Indiana	24,500	20,000	24,000
Kansas	307,150	304,000	299,900
Kentucky	24,000	23,000	24,200
Louisiana	494,300	496,000	494,800
North Louisiana	115,300	.....	115,800
South Louisiana	379,000	.....	379,000
Michigan	46,100	45,000	45,200
Mississippi	128,750	131,000	130,600
Montana	25,800	26,000	26,430
Nebraska	350	700	350
New Mexico	134,490	132,000	134,380
Oklahoma	441,300	432,000	439,400
Texas	2,515,675	2,450,000	2,515,675
Dist. 1 (Southwest)	27,935	.....	27,935
Dist. 2 (Southwest)	179,150	.....	179,150
Dist. 4 (Southwest)	250,200	.....	250,200
Dist. 3 (Gulf Coast)	503,090	.....	503,090
Dist. 5 (Eastern)	51,725	.....	51,725
Dist. 6 (Eastern)	124,875	.....	124,875
East Texas field	289,000	.....	289,000
Dist. 7-C (West)	50,425	.....	50,425
Dist. 8 (West)	743,225	.....	743,225
Dist. 7-B (W. Central)	62,350	.....	62,350
Dist. 9 (N. Central)	144,600	.....	144,600
Dist. 10 (Panhandle)	89,100	.....	89,100
Wyoming	154,520	146,000	162,410
Total United States	†5,632,045	5,540,000	5,628,860
Change from prev. wk., up	3,185		
Total production January 1-December 18			‡§1,949,968,170 bbl.
Same period last year (crude plus cond.)			1,788,010,765 bbl.

*Incl. 160 bbl. Utah production. †Not incl. 79,055 bbl. condensate. ‡Incl. 26,392,255 bbl. condensate. §Revised.

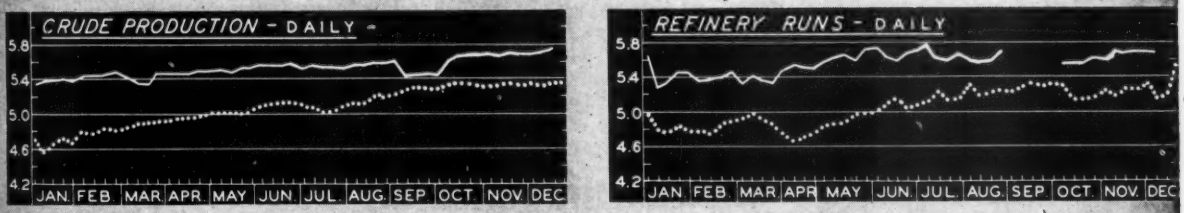
STOCKS IN UNITED STATES

---- 1947 ——— 1948



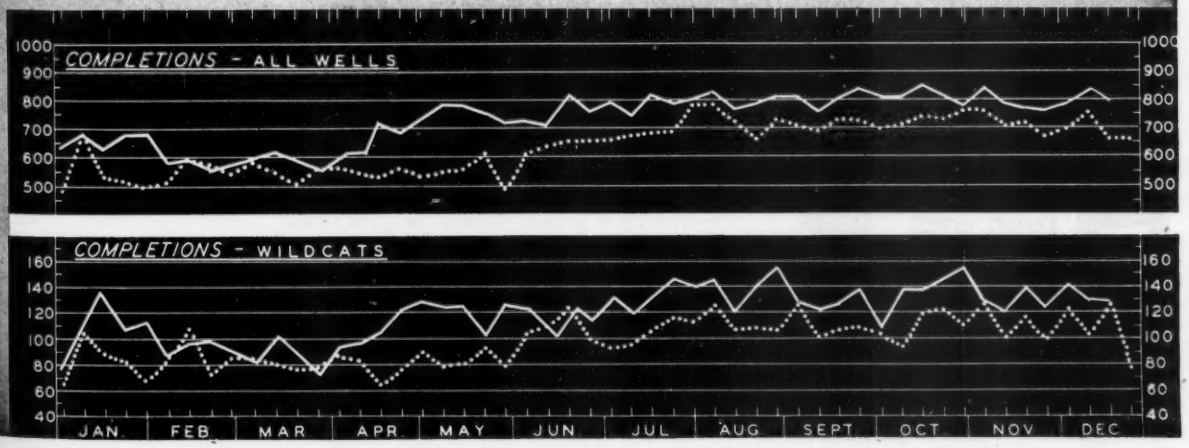
DAILY OPERATIONS

---- 1947 ——— 1948



WEEKLY COMPLETIONS

---- 1947 ——— 1948



Miller

SAND PUMPS

Standard Clean-out Tool for 25 Years

Check any oil field in the world where sediment or sand is met with and you'll find Miller Sand Pumps and Bailers are standard . . . leadership earned and held by continuous improvements during 25 years of service!

The Miller Sand Pump is made in Regular and Heavy Duty types in sizes listed below. Lug type Chisel, Sand and Bailer Bottoms are easily interchanged.

Threaded Chisel and Sand Bottoms can be supplied, to permit larger pieces of sediment to pass, and pump to be dumped without removing bottoms. Tool Pin bail allows tools and sand pump to be run on same wire line when desired.

Write for new descriptive price list on Miller Sand Pumps and Bailers. See Composite Catalogue page 2666 for details.

SAND PUMP AND BAILER SIZES:

Outside Diameter
2½"
3"
3½"
4¼"
5"
5½"
7"

Lengths
20 feet
25 "
30 "

Special Sizes and Lengths to Order!

EXPORT OFFICE
30 Rockefeller Plaza
New York 20, New York

MILLER
SAND PUMP CO.
1524 S. E. 29 • Box 4516
OKLAHOMA CITY 9, OKLAHOMA

MARKETS

LAST week the 35-cent crude-price increase inaugurated by Phillips Petroleum Co. was dropped when the company announced it would return to its former postings. Other leading companies who had met the increase were quick to follow suit in announcing their return to the old price.

Further evidence of plentiful petroleum supplies was indicated in the products market last week as it remained "sluggish" while price levels for some spot material continued lowering.

In kerosine, which has been showing a firm market demand, a reduction of ⅛ cent in the published f.o.b. Group 3 tank-car postings was noted. The new posting for 42-44 w.w. kerosine was 9¼ to 9¾ cents as compared to the former price range of 9⅜ to 9⅞ cents. Quotations for gasoline were reduced ⅛ cent per gallon bringing the new price level for motor gasoline, 73-75 octane, ASTM, regular, to 10⅜ cents per gallon for the low, with the high remaining unchanged at 10¾ cents.

New York Harbor

Socony-Vacuum announced that it had cut back its kerosine and No. 2 oil prices 0.2 cent per gallon, all methods of delivery, at Geneva, N. Y., effective December 16. Tank-car, yard, and tank-wagon prices for No. 2 were also cut the same amount at Syracuse. Reductions "were made to meet local competitive conditions."

Suppliers' quotations for No. 2 at New York Harbor generally held at 9.1 cents, tank car, and 9 cents, barges, last week. Spot trading in the harbor continued "dull" with No. 6 showing the weakest tone of all products. Most offerings of No. 2 on the spot market was at 9 cents and kerosine at 10.2 cents per gallon. Few bids were reported, however. High production and full storage was said to be forcing some No. 6 fuel oil into the open market at prices ranging as low as $2.55 and $2.60.

Mid-Continent Area

In the Mid-Continent area all products continued easy, according to most suppliers. Greatest activity was noted in the demand for kerosine, range oil, and No. 1. The reduction in the kerosine posted price was thought "most unusual" by one refiner who reported that demand for kerosine had remained firm.

Demand for natural gasoline was reported firm by one Mid-Continent supplier, and while motor fuel was "not exactly strong" one refiner said, he was not dissatisfied with the market for this material this time of year. The market for lubricating oils was reported as "soft" by one Mid-Continent refiner. Offerings of lube oils at shaded prices were reported despite the recent reductions in price levels.

Gulf Coast

Spot trading in the products market in the Gulf Coast area continued slow during the past week. The announcement that Phillips had backtracked on its price increase fell on an already "sick" market. Two cargoes of No. 2 straw fuel oil were reported as being sold well below the usual quotation. Two additional cargoes were reported as available.

Speculation as to the future of the market revolved around Phillips' action and the action of the Texas Railroad Commission in cutting the state's January crude allowable by 10 per cent.

Representative Quotations

Representative spot-market quotations of leading suppliers as of December 20, 1948. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10¼-10½	11.8-12* 10.5-12.1†	10¼-11½
Premium gasoline, 78-80 octane	11-11¼	10.6-13.4	11-12¼
42-44 w.w. kerosine	9⅜-9¾	10.3-11.2	9½-10¼
No. 2 straw fuel oil	8½-9	9.1- 9.7	9- 9½
No. 6 residual	$1.60 1.75	$2.83-2.90	$2.20-2.52

*Branded (74-76 octane); †Unbranded (74-76 octane)

NATURAL GASOLINE

	Group 3	North Texas	N. La
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9 9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	12-13.5
750 vis., No. 3-4 neutral	15-16.5
2,000 No. 5-6 neutral	17-18.5

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	27
200 vis. No. 3 neutral, 0-10 pp.	17

Western Pennsylvania

144-155 vis. 10 p.t. bright stock	30.5-40.5
180 vis. p.t. neutral	29.5-38.5

CRUDE-SCALE WAX

Mid-Continent

132-134 A.M.P.	5¼

IF YOU EMPLOY 100 PEOPLE OR MORE...

YOU CAN MAKE THESE YOUR *Success Stories!*

Payroll Plan for U. S. Savings Bonds actually increases worker production as demonstrated in large and medium-sized companies throughout the nation. Here are some examples:

PAYROLL SAVINGS MAKES EMPLOYEES MORE CONTENTED

In General Motors' My Job Contest, approximately 15,000 GM men and women gave the Payroll Savings Plan as one of the reasons they like their jobs!

PAYROLL SAVINGS CUTS ABSENTEEISM

A survey made by a smaller company in Minnesota showed that during a recent three-month period employees not on payroll savings were absent almost 2½ times more frequently than those who were on the Payroll Savings Plan. Further proof that payroll savings cuts absenteeism!

PAYROLL SAVINGS REDUCES ACCIDENTS

Records at our eleven Navy Yards show that, as participation in the Bond program increases, accident frequency and accident severity decline. When participation at the Norfolk Navy Yard climbed to over 90%, accident frequency declined over 50%, and the accident severity index dropped to 1/6 its former level!

Hundreds of companies are reporting benefits like these! Obviously, they add up to increased production.

What's more, the Payroll Savings Plan is a powerful weapon against inflation. Every Savings Bond dollar built up in the Treasury retires a dollar of the national debt that is potentially inflationary. That's good for the country's future—which means it's good for *your company's* future.

And, of course, it's good for the employee's future, because the Bonds pay $4 at maturity for every $3 invested.

If your company has the Payroll Savings Plan, make sure you and your employees are getting the most out of it! If you haven't yet installed the Plan, you're missing something! For facts or help, call your Treasury Department's State Director, Savings Bonds Division.

The Treasury Department acknowledges with appreciation the publication of this message by

THE OIL AND GAS JOURNAL
Tulsa 1, Oklahoma

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and the Advertising Council.

EQUIPMENT MEN ... in the News

Bowser, Inc., Makes Executive Promotions

Gerald J. Klopfenstein has been appointed to the newly created post of assistant to Fred S. Ehrman, vice

G. KLOPFENSTEIN

J. E. DOELLING

president and director of sales, Bowser, Inc., Fort Wayne, Ind. James E. Doelling has assumed Klopfenstein's former position as manager of the meter-sales division. Klopfenstein has been associated with Bowser for the past 25 years. Doelling joined the organization in 1937. Prior to his new assignment he was manager of the sales-engineering division.

McDonald Returns From Trip to South America

C. B. McDonald, vice president and sales manager, A-1 Bit & Tool Co., Houston, has returned from a 2-month trip to South America. During his visit he called on companies in both Eastern and Western Venezuela.

Diesel Association Elects Morse, McKinney, Fischer

Robert H. Morse, Jr., vice president in charge of all operations, Fairbanks, Morse & Co., was elected president and treasurer of the Diesel Engine Manufacturers Association at the association's annual meeting recently held in Chicago. Elected as vice presidents were A. W. McKinney, executive vice president of National Supply Co., and O. H. Fischer, president, Union Diesel Engine Co.

Directors elected in addition to Morse, McKinney, and Fischer, were George W. Codrington, vice president, General Motors Corp. and general manager of Cleveland diesel engine division; Perry T. Egbert, vice president in charge of diesel and locomotive sales, American Locomotive Co.; Robert E. Friend, president of Nordberg Manufacturing Co.; Gordon Lefebvre, president of Cooper-Bessemer Corp.; Walter A. Rentschler, vice president, Lima-Hamilton Corp. E. J. Schwanhausser, vice president in charge of sales, Worthington Pump & Machinery Corp.; Marvin W. Smith, executive vice president, Baldwin Locomotive Works. Harvey T. Hill was reappointed executive director, and enters upon his fifth year of service at that post.

National Supply Appoints Cushing Division Manager

W. T. CUSHING, JR.

W. T. Cushing, Jr., has been appointed division sales manager of a new division sales department just organized at Casper, Wyo., by National Supply Co. to integrate and expand operations in the Northwest area of the United States and Western Canada.

Cushing has been Northwestern division engineer at Casper since August of last year. New members of the staff at Casper are R. D. Stottlemyer, division engineer, formerly of the plant products division in Houston, and K. L. Thompson, who is being transferred from the company's purchasing department in Toledo.

Johnson Elected President Asbestos Manufacturing Co.

Abbott L. Johnson has been elected president and general manager of Asbestos Manufacturing Co., Huntington, Ind. He is also president and general manager of Warner Machine Products, Inc., and vice president and director of Glascock Brothers Manufacturing Co., Munice, Ind.

Rockwell Changes Office Addresses

Rockwell Manufacturing Co. has announced that the addresses of district offices of Pittsburgh Equitable Meter and Nordstrom Valve divisions have been changed to 25 Beale Street, San Francisco, and 1102 Delano Street, Houston.

MacClatchie Appoints H. F. Schlittler Vice President

H. F. SCHLITTLER

In line with a general expansion program, H. F. Schlittler has been named vice president of MacClatchie Manufacturing Co., manufacturers of specialized production and drilling equipment, according to an announcement by J. Warren MacClatchie, president.

Schlittler comes to the new post from 19 years' executive experience with leading oil-tool-manufacturing companies. For the past 3 years he has been vice president of a California oil-tool manufacturing company. He will make his headquarters in the company's Compton, Calif., plant.

Halsted Manages Allis-Chalmers District Office

Robert L. Halsted has been named manager of the Allis-Chalmers Cleveland district office, succeeding the late Arthur H. Wyman. Halsted has been manager of the Allis-Chalmers Charleston office since 1942. James Mathews, Charleston sales representative, succeeds Halsted as Charleston manager.

American Brake Shoe Elects Belury Division President

N. George Belury has been appointed president of the engineered castings division of American Brake Shoe Co., according to an announcement by William B. Given, Jr., company president.

Belury has been with Brake Shoe since 1937. Formerly division vice president, he has also served in various sales capacities with engineered castings including that of sales manager. He will continue to be located at the division's headquarters in Rochester, N. Y.

S. W. Collins Joins Ideco As Division Sales Manager

George W. Walton, vice president in charge of Machinery and Export division of Ideco, announces that S. W. "Sandy" Collins, formerly West Texas district manager for Hinderliter Tool

Co., has joined International Derrick & Equipment Co. to become New York division sales manager.

Collins has been in oil-well-equipment sales for the past 20 years, working with Oil Well Supply, American Chain & Cable Co. and Bethlehem Supply Co. He will work with A. L. Woracek and B. V. Brown who are now in Ideco's New York office.

Short Now Connected With Mud Products

Mud Products, Inc., Tulsa, distributors of drilling muds, chemicals, and mud-handling equipment, announces the appointment of E. H. Short, Jr., as chief engineer of the firm's equipment division. Short has a broad background of experience in many phases of the oil industry which began on both rotary and cable tools in a number of Oklahoma and Texas fields.

From 1925 until 1943, he was associated with Gulf Oil Corp., Tulsa, serving as chief district engineer during the famous Seminole boom, production engineer on special problems and rounding out his 17 years service as executive assistant. In 1943 he joined the Houston editorial staff of The Oil and Gas Journal. After leaving the Journal and prior to his present position with Mud Products, Short was associated with the Frank Dyke Advertising Agency, Houston.

With headquarters at Mud Products main office in Tulsa, Short will be in charge of the equipment division for all of Mud Products territories, servicing supply stores and drilling contractors and oil companies, acting as engineering consultant on all mud-handling-equipment problems.

Oakite Appoints Oldroyd Division Sales Manager

Announcement has been made by Oakite Products, Inc., New York, of the appointment of Frank L. Oldroyd as sales manager of its industrial division.

Oldroyd has been associated with Oakite for more than 15 years, 11 of which were spent as field service territorial representative in various sections of the country. He has also served as division manager in Atlanta and Chicago and as special field sales manager. Oldroyd will direct Oakite's field staff from the company's general offices.

President Lebanon Steel Receives National Award

In recognition of outstanding contribution to alloy-steel development, the American Society for Metals has conferred its distinguished service award on William H. Worrilow, president of Lebanon Steel Foundry, Lebanon, Pa. The company is a supplier of corrosion-resistant and heat-resistant alloy steel castings to the oil industry.

Announcement of the award was made during the thirtieth National Metal Congress and Exposition in Philadelphia. The citation emphasized the recognition accorded to Worrilow "for promoting the use of alloy steel castings throughout American industry."

Burkhalter Succeeds Pearce At Spicer Manufacturing

R. R. BURKHALTER

R. R. Burkhalter has been appointed chief engineer of the universal joint division of Spicer Manufacturing division, Dana Corp., succeeding J. W. B. Pearce, who retired after 43½ years with the company. Burkhalter has been with Spicer for 20 years.

Chain Belt Establishes Warehouse in Atlanta

Chain Belt Co., Milwaukee, has established a new warehouse in Atlanta, Ga. The Atlanta district office will also operate from this address under the direction of J. S. Moore, district manager. The new warehouse will be under the supervision of C. J. Schuelke formerly of the Milwaukee office. The warehouse will serve the Southeast including the states of North Carolina, South Carolina, Virginia, Georgia, Florida, and Alabama.

Peters Making Field Trip For Technical Oil Tool

H. H. (Pete) Peters, general sales manager, Technical Oil Tool Corp., Ltd., is on a tour of the 16 districts in Texas, Louisiana, and Mid-Continent areas in which the company maintains direct service headquarters.

Accompanied by E. G. McConnell, Mid-Continent sales manager, Peters is inspecting service facilities in each location and appointing additional personnel to the field staff. Peters will also visit many of the Continental Supply Stores which carry stocks of Technical Oil Tool equipment.

Rager, Kraatz Elevated By Oil Well Supply

Ralph W. Rager was elected vice president of Oil Well Supply Co., U. S. Steel subsidiary, and Erwin P.

R. W. RAGER

E. P. KRAATZ

Kraatz was named comptroller in executive-staff promotions announced by Fred F. Murray, president. In his new post, Rager, who has been comptroller since October 1944, will serve as administrative assistant to the president.

A graduate of Southern Methodist University in 1929, Rager joined Oil Well as an accountant in April 1936. He was made general accountant in January 1938 and was named assistant comptroller in June 1941. During the late war, he was also in charge of manufacturing accounting for the company's eastern plants.

Kraatz has been senior assistant comptroller since October 1, 1948. A native Texan, he became connected with Oil Well Supply in the accounting department after his graduation from the University of Texas in June 1937. In December 1940, he was made general accounting supervisor. In June 1942, he entered the Navy as an ensign in cost inspection, and was separated in February 1946 as a lieutenant commander.

He returned to Oil Well in February 1946, assistant to comptroller in Dallas, and in June 1947 was transferred to Oil City, Pa., as assistant comptroller in charge of accounting for the company's eastern plants and export office.

LeTourneau Names Sevick

Jim Sevick has been named district sales representative for R. G. LeTourneau, Inc., for the states of Oklahoma, Arkansas, Mississippi, Louisiana, and western Tennessee. Sevick has been at Oakland, Calif., for the past few months as assistant to LeTourneau's western sales manager. Before joining the company early in 1948, he was industrial engineer for Johns Mansville Corp. at Waukegan, Ill.

Robert Ray Opens Plant

Robert Ray and Rogers-Ray Co., Houston, have recently moved their offices from the National Standard Building to newly constructed office and plant at 2500 Bolsover Road.

(Continued on page 119)

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads, 12 cents a word. Minimum charge, $3.00 per insertion.
Centered Line, any ad, $1.00.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$12.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
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THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

EQUIPMENT FOR SALE

WELL drilling spudders, beams, light rotaries, core drills, tools, casing. Used equipment at money saving prices. Spang and Mills new tools. Leschen lines. Everything for well drilling. Pressey & Son, Pueblo, Colo.

MURPHY DIESEL, ME-66

Brand New—Sacrifice—At OEM's Cost 1103 cu. in., 6-cylinder, 180 HP, @ 1200 RPM. Never been used. 20% off list. Contact: Box C-813, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Emsco G-350 Draw Works bought July 1, 1948. Powered with two D-13000 Cats, or I will keep motors and you can equip with any you desire; or I will sell complete rig with mast. Draw Works designed for three motors. Rig is better than new because it will cost less and is complete with everything needed on rotary drilling rig. Reason for selling, too much rig for work in this area. This equipment will stand inspection. C-691, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT FOR SALE

FOR SALE: Oil Well Service Unit—Muskogee Model T Single Drum with Buda Model K428 Motor—Mounted on D-40 International Truck—45′ Telescope A Mast Ready for Work. ¾″ x 5000′ Line, ⅞ x 800′ Tubing Line, Few Tools, all for $3850.00. General Tool & Supply Co., P.O. Box 4387, Phone 6-1335, Oklahoma City, Okla.

PIPELINE Construction Equipment for Sale: Pipe cleaning machine with priming head, traveling or stationary, 6″ to 12″, excellent condition, $1,350. Two T40 International tractors with pipelayer attachments, good condition, very cheap. Contact C. W. Sternberg, 8250 Wier Drive, Houston, Texas. Phone Preston 7043.

FOR SALE: We have abandoned several gasoline plants in Oklahoma and have available, cheap, quantity such items as absorbers, centrifugal and steam pumps, gas and steam turbines, steam engines, closed type heater and cooling sections, cooling towers, horiz. engine compressor units. Catalog with prices listing such material available upon request. Cities Service Oil Company, Patridge, Bartlesville, Okla.

FOR SALE

12—230 H.P. Type 10 Bessemer New 17′ Power Cylinders complete ready to run with 16″ to 18″ Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 655, Evansville, Indiana

FOR SALE

Three 8000′ capacity steam rigs complete with 129′ releg derricks and substructure, blowout preventers, drill pipe, and everything ready to put to work. Rigs located at or near Alice, Tex.

For further information, write

AL BUCHANAN DRILLING COMPANY
2114 Alamo National Bldg.,
San Antonio, Texas

or Frank Buchanan, c/o Al Buchanan Drilling Company, Box 1308, Alice, Texas

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

1—4,000′ POWER Rotary Drilling Rig complete with 87′ Moore Mast and Subbase. 2 EK Waukesha Motors with extension shafts (V-Belt), excellent condition. 6 x 16 Wilson Snyder Power Pump. 5 Drill Collars, Kelly, Etc. Will sell as one unit or separately. Phone 41213, Wichita, Kansas.

SAVE WITH SAFETY—Very Good Used Wire-Line—Any Size or Length up to 5,000′—Respooled for Your Inspection — Cable Tools For Sale. General Tool & Supply Co., P.O. Box 4387, Phone 61335, Oklahoma City, Okla.

MANUFACTURERS LATEST DESIGN

Hydraulic Casing Pulling Units. Complete line of equipment. Units made to your specifications. Truck Mountings or Skid Units. Repair Service and Parts

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Exposed liner type, Model C-12, Serial 213, size 7¼ x 12.

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Extra gaskets, valves, seats, heads, rods, and 1 set of 7¼ Emsco liner and 1 set of 6¾ Emsco liner.

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8⅝″, 10¾″, 12¾″ up to 36″ OD in 10 ga., ¼″, ¼″, ⅜″ and ⅜″ Wall

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A RUGGED 7,500′ ROTARY RIG

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OIL WELL SUPPLIES
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NEW PLAIN HOT ROLLED, ANNEALED MILD STEEL SHEETS
Approx. 180 TONS—12 ga. x 36″ x 96″
CARBON = .12 max.

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Approx. 280 TONS—$\frac{1}{16}$″ x 5′ x 15′
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NEW INVASION PIPE: 15,000 ft.—4" OD, P.E., Electric Weld in random lengths of 20 ft. New Naylor Spiral Weld Pipe: 2500 ft. —8⅝" OD Pipe in 40 ft. lengths. 5000 ft.—16" OD, Used Pipe, with ¼" wall thickness. 1500 ft.—6" Used Spiral Weld Pipe, 30 ft. lengths. 11,000 ft.—10¾" OD, Used, P. E. Line Pipe, Weight 28 and 32 lbs. A. A. Gilbert Pipe & Supply Co., P.O. Box 986—Phones 2-5529 and LD-97, Shreveport, Louisiana.

1—5½ KEYSTONE (Joplin Special), A-1 condition, Electric Starting equipment. Butane Equipment, Kohler light plant, steel doghouse, good cordage and tools—8"-6"-5". J. E. Jolly, Drilling Contractor, 305 North Seminary, Princeton, Indiana.

FOR SALE: Rotary rig, Wilson Giant draw works, 90 foot L. C. Moore mast, Wilson-Snyder 6x16 pump. Allis-Chalmers L-90 and International 110 H. P. motors. All tools and equipment complete except drill pipe located at Hobbs, New Mexico. Price $21,500.00 f.o.b. Hobbs. Address Donald Brown, Postoffice Box 1126, Roswell, New Mexico. Telephone 2973.

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200,000'—2⅜" Good Used Line Pipe
2" 4 lb. Regular Tubing, steam cleaned
2½" Upset Tubing
25,000' Seamless 5½ O.D. Range 2 & 7" O.D.

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LUFKIN PUMPING UNIT

Model TC-2-A-35 complete with #140 GKU Waukesha engine located in Houma, La. Used short time and in good condition. Price $3,700.00 F.O.B. Houma yard. For further particulars contact The Louisiana Land and Exploration Company, American Bank Building, New Orleans, La.

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LARGE AND SMALL

All are truck mounted, rotary chain pull down, smallest pump size 3½ x 5 Some are in excellent condition, others need repairs. Price FOB Dallas from $3,000.00 to $8,000.00 including truck. For details write 8800 Lemmon Ave., Dallas 9, Texas.

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Largest stock in America, 6x8, 6x4, 4x4, 4x2. All items guaranteed. Largest auto wrecking house in the west with most complete stock of new and reconditioned parts for all cars and trucks. New jeep power units complete with radiators and stub shafts. Fast service.

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EQUIPMENT FOR SALE

FOR SALE: Star 83 Speedster Spudder, excellent condition; two WAK Waukesha Engines completely overhauled; one NK Waukesha engine complete with clutch. All priced to sell. Lesh Drilling Company, Box 305, St. Elmo, Illinois, telephone 261.

FOR SALE: 2343 feet, long collar 8-round thread—7 in. seamless 20-lb. casing. Can be inspected Elam Truck Co. Yard, Abilene, Texas. Owner: A. C. Stralla, 312 So. Elm Drive, Beverly Hills, California. Phone: Crestview 1-2018.

EQUIPMENT FOR SALE

FOR SALE: New 48" x 30" Triple Sheave Grooved for 1⅛" Wire, McKissick Streamlined Traveling Block. Reduced price. Box C-712, The Oil and Gas Journal, Tulsa, Okla.

FOR SALE: One G.S.I. core drilling rig complete with 500 feet Failing N rods, core barrel, subs, bits, bailors, fishing tools, spare parts for drill, etc. Mechanical pull down, mounted on 1942 Ford V8 truck, bargain at $6,000.00. Will take $5,000.00. Alide Wells Company, 1449 So. Bdwy., Denver, Colo.

CAST IRON PIPE

Bell and Spigot Class 150 and 250

2,100 ft. 4 in.		
21,500 ft. 6 in.	**14,250 ft. 10 in.**	**3,000 ft. 20 in.**
16,280 ft. 8 in.	**32,450 ft. 12 in.**	**11,000 ft. 24 in.**

12 ft. and 18 ft. lengths

Immediate Delivery Any Quantity

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WATER PIPE VALVES HYDRANTS

Approximately 100,000 feet used black and galvanized steel pipe. 20' lengths. Excellent condition. Steel equal to new. Standard T&C

15,000 ft. 1"	12,000 ft. 2 1/2"
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8,000 feet 6" heavy and extra heavy—plain ends—40' lengths.

Large stock used light standard and standard Iron Bodby, Double Disc Gate Valves, Brass Trimmed. Flange or hub type. Sizes 6", 8", 12", 16"—Condition equal to new.

One 16" Clayton Altitude Valve. One 16" Check Valve.

250 used Fire Hydrants, in excellent condition—Kupferle #75 with two 2 1/2" and one steamer nozzle, 5" valve opening, 6" hub opening, flanged or universal hub connection, 3' and 3 1/2' burial, Pacific Standard Thread conforming to specifications of the American Waterworks Association, tested and approved by the National Board of Fire Underwriters and Associated Factory Mutual Fire Insurance Companies.

935 sections of galvanized steel hoops for water tank—each 23'-6 3/4" long, diameter 1" with lugs and nuts. Cut threads—Excellent condition.

Subject to prior sale.

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CARDWELL Double drum Model RL spudder used only 6 months, excellent condition, complete with lines, tools, light plant, etc. Folk Drilling Co., Yukon, Okla.

FOR SALE: Wilson Mogul draw works powered by G.A.K. Waukesha engine. Good condition, priced for quick sale. Terms. Melton Supply Company, Seminole, Oklahoma.

BUDA GASOLINE POWER Unit, 164 HP, $1775.00; G.M.C 6-71 Diesel Power Unit, $2000.00. Write or Phone: Werzel Machinery Company, Harrison 0021, 2136 Jefferson Street, Kansas City, Missouri.

FOR SALE: Failing model 44, new motor, radiator and tires. 4½ X 5 Gardner-Denver pump. Failing Automatic chuck. Fred E. Butler, 1013 So. Cedar St., Casper, Wyo.

FOR SALE Approximately: 1000′ of 13″ O.D. 50#; 2100′ of 10¾″ O.D.; and 2700′ of 8⅝″ O.D. used Seamless, 8V-Thd. Range 2 Casing. Box C-717, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE portable rotary water well drilling rig, dual engines, now operating, good for one thousand feet. Box C-714, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: One rotary drilling rig complete, capable of drilling to 4,000 feet with ease. Powered with two 6 Cyl. 185 H.P. G.M.C. Diesel motors. 7¼ x 12 Gardner-Denver pump that has only drilled 2—3,000′ wells. 86′ mast made out of 4½″ drill pipe. Raises same as L. C. Moore and only drilled one well. Complete with approximately 2,500 feet 4½-inch Range 2, F. H. drill pipe. Will sacrifice for $25,000.00. Alide Wells Company, 1449 South Broadway, Denver, Colo.

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100 KW Diesel Generator Sets—6 of them

Like New—Priced to Sell

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3300 Feet New Cast Iron Pipe
Bell and Spigot
Class 150
18 Foot Lengths

VICTORY SUPPLY CO.
P.O. Box 754 Phone 5-2073
Tulsa, Oklahoma

EQUIPMENT WANTED

ONE spider with slips and one elevator for twenty-four inch O.D. casing. Texas Water Wells Inc., 951 McCarty Ave., Houston 15, Texas.

WANTED

Natural Gas Booster Compressor with 300 Lbs. minimum discharge pressure, capable of delivering 1½ million ft. of gas per day with an inlet pressure at present at 250 lbs. but expect it to do same work one year later with an inlet pressure between 50 and 100 lbs.

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AVAILABLE immediately, manufacturing facilities consisting of large processing tanks 300,000 gallon storage capacity, tank car handling, 10,000 square feet warehouse, two 125 H.P. gas fired boilers, RR siding, labor plentiful. Location, Wichita Falls, Texas. Write Box C-710, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

WANTED: Geologist for supervisory and administrative duties exploration and drilling project Middle East. Should have some experience in seisimc and surface work. Age 30 to 45. Reply Box C-704, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Accountant experienced in Refinery Property and Yield accounting. Give full details of training and experience in first letter. Write Box C-711, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERING SALES REPRESENTATIVE

OLD established manufacturer seeks representative with mechanical engineering background and mechanical interests. This man will operate in the South West as engineering sales representative and should be thirty to forty years of age with some field sales experience. Salary to be based on qualifications. An unusual opportunity for the right man.

Box C-723, The Oil and Gas Journal
Tulsa, Oklahoma

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Economic

SENIOR PALEONTOLOGIST

SURVEYORS

Triangulation
Recorder-Triangulation
Precise Leveling

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Career employment opportunities. Room and Board furnished. Paid vacation in U.S. after each 24-month period. Retirement plan and liberal benefits.

If interested, apply by letter giving complete employment and personal history.

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RESEARCH CHEMIST

An exceptional opportunity is available for an organic chemist with special training in aliphatic chemistry and broad experience in polymerization and alkylation. A Ph.D. is a prerequisite. It is essential that the applicant have supervisory capacity and ability to coordinate his activities with those of others. The research laboratories are located in the east, with a large organization expanding its research staff. Salary will be contingent upon the qualifications of the man selected. Give full details, including salary expectations in first reply.

Box C-719

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

RESEARCH ELECTROLOGGING ENGINEERS

(a) Supervisor for research project on a study of fundamentals of electric logging of wells. Advanced degree and training in physical chemistry and/or physics desirable.

(b) Research assistant for above project. Salaries open for above positions. Opportunity for graduate study leading to advanced degree. Address letters containing summary of training, experience, and personal data to Director of Mineral Industries Research, The Pennsylvania State College, State College, Pennsylvania.

WANTED

For Houston and Gulf Coast Area, Man Qualified to head special Rotary Sales Department with Major Supply Company. Must have Engineering Degree. Give Age, Experience, Salary Requirements and References.

Box C-705

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

ENGINEERING

During the next several months we will increase our Engineering Organization engaged in the design of Oil Refinery Plants and Power Plants. Location Cleveland, Ohio. The men we need should be qualified as draftsmen, designers, checkers or in higher engineering skills on design of piping, instrumentation, pressure vessels, structural steel, concrete, mechanical or electrical. For presenting your qualifications and prompt consideration, write to us for application form.

ARTHUR G. McKEE & CO.
2300 Chester Ave., Cleveland 1, Ohio

HELP WANTED

OIL Industry Employment Service, 319 Castle Bldg., Tulsa, Okla. Tom Robinson, Mgr., phone 4-5974. No fees to pay. Needed in Persian Gulf area, Middle East. Petroleum Engineers, salary open. Rotary drillers $565. Derrickmen $495. Supervisory chefs $400. Oilfield Welders $425. Truck Foremen $450. Write for details.

DESIGNER

A nationally known valve manufacturer with several U. S. plants, supplying the oil and gas industry, has an excellent opening for an experienced valve designer. Must be thoroughly acquainted with valve industry and have creative ability. Good income, permanent and offers right man a responsible place. Give full particulars in first letter.

Box C-706

THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

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has openings in both North and South America and the Middle East for

Experienced Seismic

Party Chiefs
Seismologists
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SITUATIONS WANTED

GEOPHYSICIST: Graduate Engineer with ten years seismograph experience as Party Chief and Supervisor over twelve state area desires position in seismic review or interpretation at permanent location. Presently employed as Supervisor of several seismograph crews. If interested, please give general information as to salary and position available. Box C-677, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, graduate with B.S. degree in 1941, experience in production, drilling, well completion, production problems. Available immediately. Write Box C-715, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE GEOLOGIST, 10 years experience, six years supervisory capacity. Qualified for district or chief geologist. Central Texas and Rocky Mts. Box C-718, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Three years experience in the Permian Basin and surrounding area desires association with company located in Midland. Young, married, best of references. Box C-720, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Number of years varied experience with major oil company desires position with independent concern. Box C-721, The Oil and Gas Journal, Tulsa, Oklahoma.

REPRESENTATIVE: Oklahoma territory preferred. Experienced sales production, drilling, refining and pipeline equipment and supplies. Box C-722, The Oil and Gas Journal, Tulsa, Oklahoma.

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BURKHART LEGAL BLANKS since 1908 Oil-Gas (all states), Business, Real Estate, Legal Forms, Leases, Revised With Government Regulations, Commercial Printing, Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma.

ROYALTIES

DEEDED ROYALTIES
San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington, New Mexico.

ROYALTIES IN HOT AREAS!
Recent strikes have focused attention on Montana's deeper oil zones and major companies are moving fast, drilling and leasing. We buy direct in the field, sell direct to our customers. Write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

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OIL INVESTMENTS
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Prompt attention given inquiries.
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P. O. Box 1918, Tulsa 1, Oklahoma

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell, Registered Patent Attorneys, Suite 418, 815-15th Street, N.W., Washington 5, D. C.

LEASE AND DRILLING BLOCKS

830-ACRE block, Osage County, Oklahoma. Near production with four sands 1600 to 2050'. Will farm out block to responsible operator who is financially able to drill several wells and develop block. Box C-652, The Oil and Gas Journal, Tulsa, Oklahoma.

TO LEASE for oil 640 acres Reagan County Texas 5 miles S. W. Styles 3 miles north University lands Quarter mile south Centerela on Middle Concher River at Big Rock. L. B. Dougal, 2001 Concourse, Bronx, New York.

PROSPECTIVE new shallow, high gravity oil field, N.W. Ga. Mississippian, Devonian, shale and limestone exposures. Good structural indications. Drilling deals considered. Dietzen, Rt. 3, St. Elmo, Tenn.

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PRODUCING OR NONPRODUCING
Texas, New Mexico, Oklahoma, Louisiana and Illinois
Inquiries Invited
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FOR SALE

SMALLEST, Prettiest, Miniature Tri-Cone Rock Bit made. Less than one-half inch diameter. Cones turn. Gold or Nickle plate. On tie chain clasps, strap type for watch fobs and ring type for charms. $5.00 each Money Order or C.O.D. H. McGaughey, P. O. Box 11063, Houston, Texas.

FOR SALE:
KANSAS WELL LOGS
Complete and up to date set Kansas well logs. Filed in Folders by townships and ranges. Address inquiries to:
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OPERATING Personnel Lists of Production, Refining, Natural Gasoline, Pipelines, Drilling, Supply Stores, etc. Guaranteed. Catalogue Free. Our 29th Year. Oil Industry Mailing List Co., Box 2603, Tulsa, Okla.

Equipment Men

(Continued from page 115)

Smith Becomes Board Chairman U. S. Rubber

Herbert E. Smith, president of United States Rubber Co., will become chairman of the board and chief executive officer of the company, and Harry E. Humphreys, Jr., vice president and chairman of the finance committee, will become president and chairman of the executive committee.

Smith and Humphreys were elected at a recent meeting of the board of directors when F. B. Davis, Jr., chairman of the board and chief executive officer for 20 years, announced his retirement. Davis will continue as a director and member of the finance committee.

Arthur Surkamp, treasurer, was elected vice president and chairman of the finance committee to fill the vacancy created by Humphreys' promotion. Surkamp was also made a director and a member of the executime committee. Herbert M. Kelton, general auditor, was elected treasurer.

Livingstone Makes Babcock And Wilcox Appointments

The appointment of James A. Anderson of New York, as assistant general sales manager of Babcock & Wilcox Tube Co., Beaver Falls, Pa., has been announced by Edward A. Livingstone, vice president in charge of sales. He became associated with the company's district sales office in New York in 1941 and has been assistant manager of that office since 1944. Anderson will make his headquarters in the general offices at Beaver Falls.

William H. Buley has been appointed manager of stainless sales of the company. He joined the sales department of Babcock & Wilcox in 1939, and has recently been manager of the general sales office. He will maintain headquarters in the general offices.

Summers Visiting U. S.

C. R. Summers, South American representative for Mission Manufacturing Co., Thornhill-Craver Co., and A-1 Bit & Tool Co., recently returned to Houston for a visit. He expects to remain in this country for a month or 6 weeks before returning to his office in South America.

ADVERTISERS OF EVENTS

Allis-Chalmers Mfg. Co. 20
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Baird Manufacturing Co. 106
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Permian Basin

(Continued from page 109)

Casing was set at 4,708 ft., and the well flowed from open hole between 4,724-54 ft., in the Strawn lime. Flowing pressures ranged from 70-90 psi. on tubing, and 110-120 psi. on casing. After shut in for two days, bottom-hole pressure registered 1,915 psi., and oil was standing within 100 ft. from the surface. T & C Drilling Co., contractors on the well, were to skid the rig to a diagonal northeast offset location for the 1 John D. Robertson.

In the Opp area (abandoned) 3 miles northwest of Eldorado, Schleicher County, Skelly Oil Co. 1 Mrs. J. Jackson flowed 85.8 bbl. of 32°-gravity oil in 9 hours, from the Canyon limestone of the Pennsylvanian. Pay is from open hole, from bottom of casing at 4,063 ft. to 7,109 ft., total depth.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Andrews County: Skelly Oil Co. 1-G Texas University, Sec. 34, Blk. 12, University Lands, dry, TD 7,243 ft., show dead oil 7,185-7,235 ft.

Dickens County: Magnolia Petroleum Co. 1 T. D. Wiley, Sec. 305, H&GN Sur., 5½ mi. NE Spur, dry, TD 7,716 ft., Mississippi 7,260 ft., pre-Cambrian 7,697 ft., elev. 2,307 ft., oil stain 6,610-13 ft.

Runnels County: Superior Oil Co. 1 J. E. McDowell, Sec. 80, T&NO Sur., 1½ mi. NW Miles, dry, TD 6,307 ft., elev. 1,856 ft.

Terry County: York & Harper 1 W. M. Sleeper, Sec. 7, Blk. C-38, PSL Sur., 5½ mi. NW Welch townsite and 5 mi. NE Adair field, dry, TD 5,012 ft., San Andres 4,410 ft., elev. 3,163 ft.

SOUTHEASTERN NEW MEXICO

HOBBS. — Four miles northeast of the Crossroads discovery, Magnolia Petroleum Co. 1 Cox-Federal, 1-9s-36e, was reported running high, structurally, to the discovery. It had tops on the San Andres at 4,100 ft., and the Glorietta at 5,200 ft., on an elevation of 4,058 ft. On last report it was drilling lime below 7,588 ft. Magnolia's 1-C Santa Fe-Pacific, 26-9s-36e, east offset to the discoverey, was believed to be in the Mississippi section at 11,925 ft. Tentative tops place it about 100 ft. low, structurally.

Mid-Continent Petroleum Corp. 1 Dessie Sawyer, 27-9s-36e, northwest offset, was drilling ahead below 11,567 ft. Skelly Oil Co. 1 Sawyer, 33-9s-36e, southwest extension try, was thought to be in the Pennsylvanian at 11,891 ft. Mid-Continent 1-B Sawyer, 34-9s-36e, was drilling below 11,854 ft.

Magnolia 1 Yates-Federal, NE SE 31-9s-36e, 3 miles southwest of the Crossroads field, plugged back from 4,922 ft. to 4,865 ft. and swabbed 70 bbl. of oil and 72 bbl. of salt water in 24 hours. It continued testing. In the same area, Amerada Petroleum Corp. 1-C-A State, 9-10s-36e, reported 60 ft. of slightly gas-cut drilling mud on a 1-hour drill-stem test from 4,872-4,928 ft. (San Andres?), and drilled ahead below 4,985 ft.

Continental Oil Co. completed its 1 B-29, 29-20s-38e, Lea County, for 3,529 bbl. per day through a 1-in. choke on 2½-in. tubing. Pay zone is the McKee sand topped at 8,943 ft. Location is 3 miles north of the Drinkard field and 10 miles south of Hobbs.

Phillips Petroleum Co. 1 Shipp, NW NE 20-18s-37e, was drilling in dolomite below 7,815 ft. A 90-minute drill-stem test at 7,605-7,775 ft., in the lower Andrews section, recovered 450 ft. of slightly gas-cut mud, plus 1,680 ft. of sulfur water.

SOUTHEAST NEW MEXICO WILDCAT FAILURES

Eddy County: Barney Cockburn 1 Pecos Irrigation Co., NW NW SE 35-24s-28e, dry, TD 2,819 ft., Salt 2,060 ft., Delaware sand 2,658 ft., elev. 2,964 ft.

Resler Oil Co. 1 McKee, SE SE NW 33-20s-25e, dry, TD 850 ft. in lime.

Lea County: McCurdy & McElroy 2 Barton, SW SW SE 30-18s-32e, dry, TD 4,260 ft., show of oil 3,659 ft.

CALENDAR IN THIS ISSUE

1949

January

Society of Automotive Engineers, annual meeting, Book-Cadillac Hotel, Detroit, Mich., January 10-14

February

American Institute of Mining and Metallurgical Engineers, annual meeting, Fairmont Hotel, San Francisco, February 13-17.

American Society for Testing Materials spring meeting and A.S.T.M. committee week, Hotel Edgewater Beach, Chicago Ill., February 28-March 4.

March

American Petroleum Institute, Southwestern district, Galvez Hotel, Galveston, Tex., March 9-11.

American Petroleum Institute, division of production, Mid-Continent district meeting, Mayo Hotel, Tulsa, March 23-25.

New England Gas Association, Hotel Statler, Boston, March 24-25.

Western Petroleum Refiners Association, thirty-seventh annual meeting, Plaza Hotel, San Antonio, Tex., March 28-30.

American Chemical Society, division of petroleum chemistry, spring meeting San Francisco, March 27-April 1.

April

American Petroleum Institute, Division of Refining, mid-year meeting, Shamrock Hotel, Houston, April 4-7.

American Society of Lubrication Engineers, annual meeting, Pennsylvania Hotel New York, April 11-13.

National Association of Corrosion Engineers, annual convention, Netherlands Plaza Hotel, April 11-14, Cincinnati, Ohio.

Southwestern Gas Measurement Short Course, University of Oklahoma, College of Engineering, Norman, Okla., April 12-14.

National Petroleum Association, Hotel Cleveland, Cleveland, Ohio, April 13-15.

Natural Gasoline Association of America annual meeting, Texas Hotel, Fort Worth, April 20-22.

Southern Gas Association, annual convention, Buena Vista Hotel, Biloxi, Miss., April 20-22.

American Petroleum Institute, Eastern district, William Penn Hotel, Pittsburgh, Pa., April 27-29.

May

Independent Petroleum Association of America, mid-year directors meeting, New Orleans, La., May 2-4.

American Gas Association, natural-gas department, spring meeting, French Lick Springs Hotel, French Lick, Ind., May 9-10

American Petroleum Institute, division of production, Pacific Coast district meeting Biltmore Hotel, Los Angeles, Calif., May 12-13.

American Petroleum Institute, Rocky Mountain district, Gladstone Hotel, Casper Wyo., May 26-27.

June

American Society for Testing Materials fifty-second annual meeting, Hotel Chalfonte Haddon Hall, Atlantic City, N. J. June 27-July 1.

NOMADS

Houston Nomads, second Monday of each month, The Houston Club, Houston.

Los Angeles Nomads, second Wednesday each month, Jonathan Club.

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